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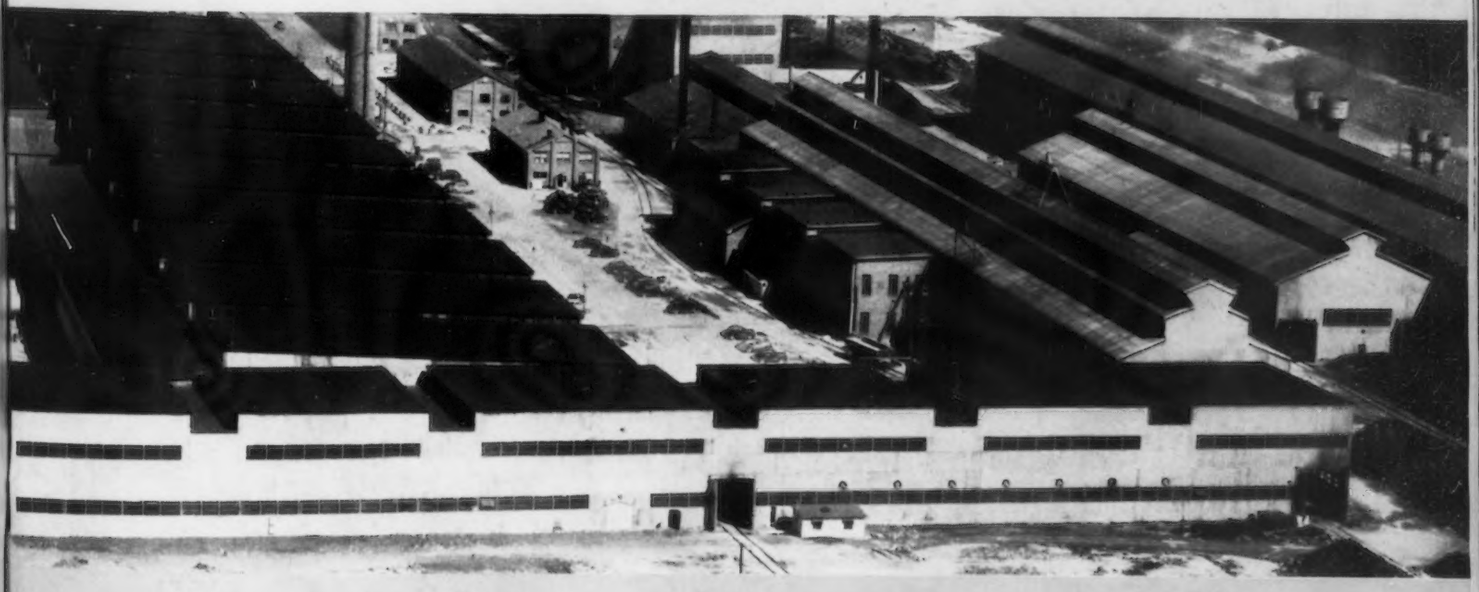

turn to pages 78 and 79

A WARNER and SWASEY 2-A UNIVERSAL HEAVY DUTY TURRET LATHE equipped with a cross sliding hexagon turret, turning a crankshaft for an aircraft engine.

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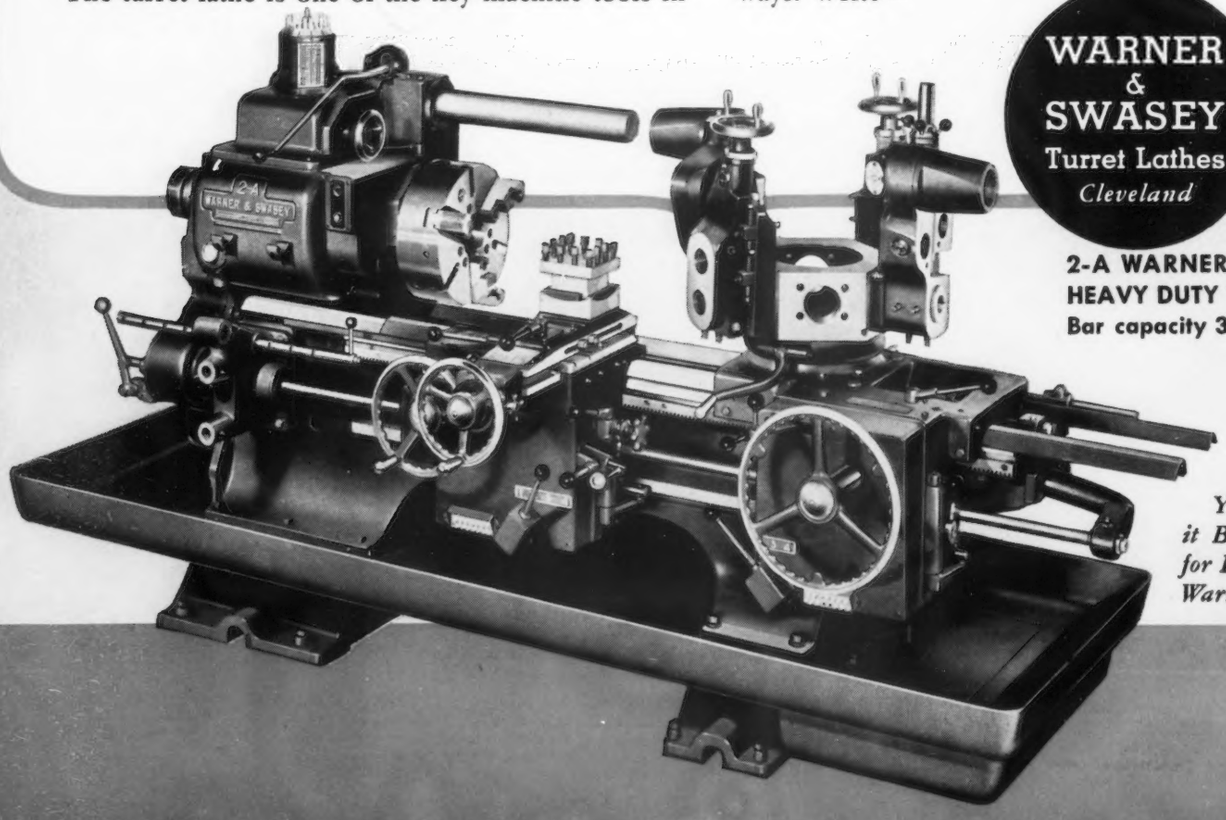

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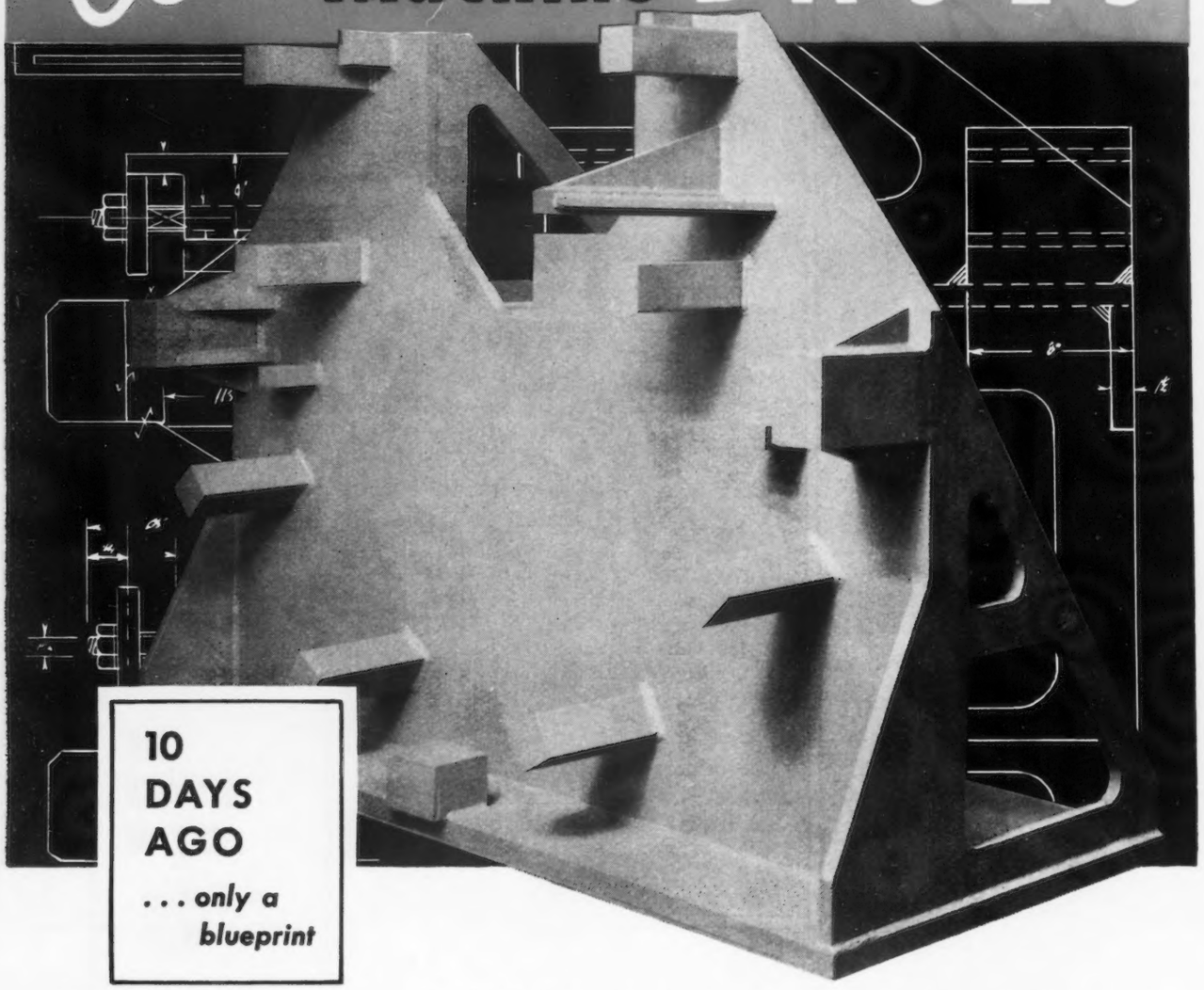

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The Iron Age

JUNE 26, 1941

ESTABLISHED 1855

Materials and War

THIS week the men who manage America's vital resources are meeting in annual convention at Chicago. I refer to the American Society for Testing Materials.

Men of this sort have played an increasingly important part since the days of Adam.

When Adam arrived on Earth, and until he left it, he was a vegetarian both as to dress and diet. And there was then no industry. Yet there *was* then as much or even more iron ore and coal underground; as many potential horsepower of water fall and stream; all of the myriad materials for building cities and motor cars and even munitions were there under Adam's feet or surrounding him but unseen by him and unknown for centuries later.

Even had Adam known about these things; even though he had been able to dig into the earth and produce the ore or to dam the streams in crude fashion, there could have been no progress until men learned how to measure and to control our natural resources.

That knowledge had to await the passing of 70 centuries. It had to await the coming of age of the engineeer with his microscope and galvanometer, his crucible and retort; his precision balance and his standardized measures of dimension.

It is not a mere coincidence, in my opinion, that the so-called "Machine Age" which includes the electrical age and the chemical age, was ushered into being in 1870 under the concomitant beginnings of the scientific control of materials through testing and inspection.

Germany had the benefit of experience in the management of materials and their conservation during the last war. Witness the "ersatz". Little did we then think that blessed with a superabundance of natural resources we would come to the point of being forced to search for substitutes.

From the standpoint of progress both in war and peace, the quantitative and qualitative control of materials is even more vital in importance than their discovery and application.

The modern demands of Mars put a tremendous load upon these gentlemen who are the managers of our material resources and who are charged with the job of seeing that he gets what he wants and needs.

J. H. Van Deventer

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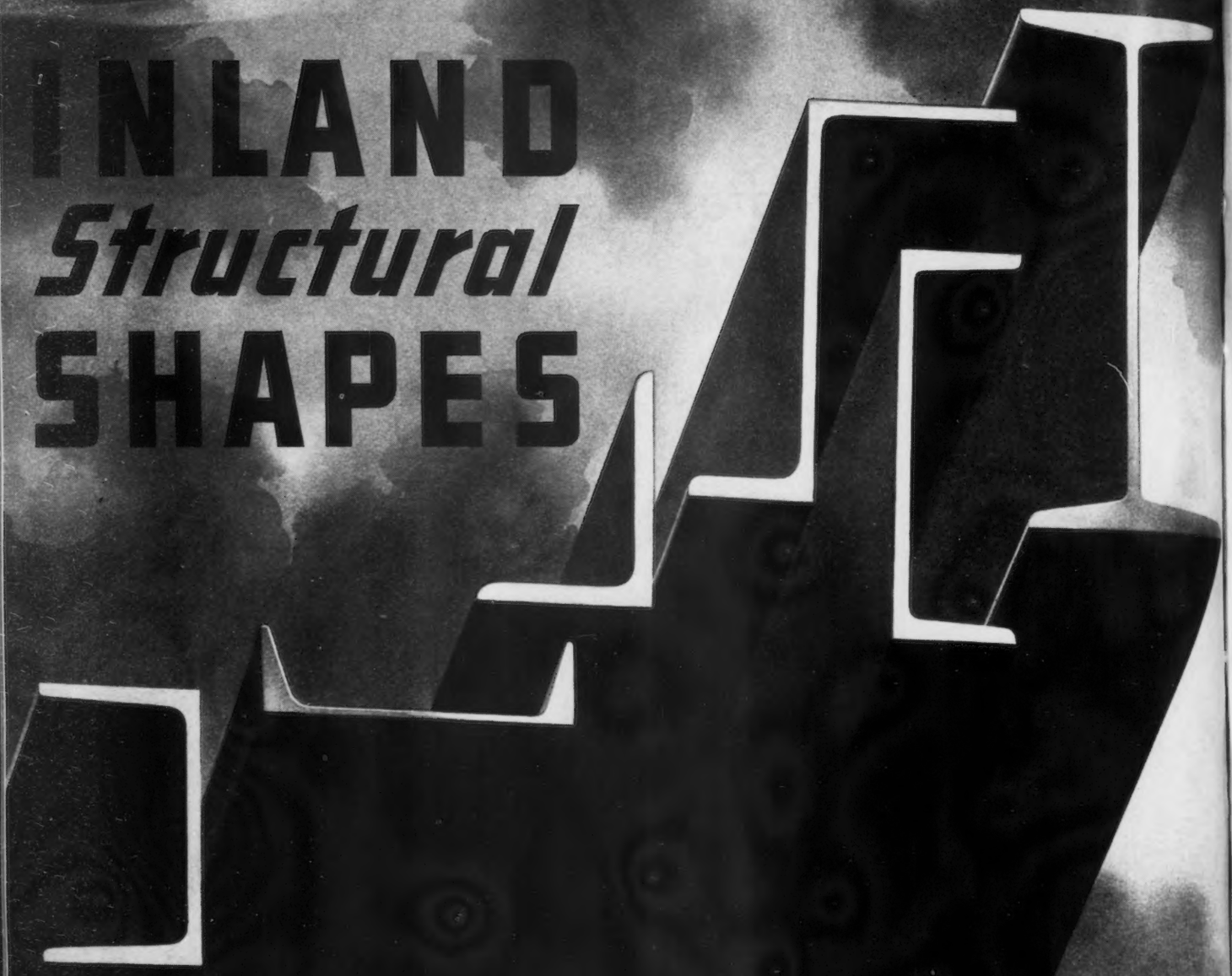

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A Practical Classification of

Tool Steels

There have been many classifications of tool steels according to country, chemical analysis, and manufacturers' trade names (as, for instance, "1500 Tool Steels" currently appearing in THE IRON AGE). This article is an attempt to classify the types of tool steels found in most tool rooms and jobbing shops. After learning the properties of these steels, they may be classified according to the main reason for which they are used, as in Table I. This table aids in selecting the proper steel for a given tool by keeping the main properties of each steel in the foreground.

THE need for tools to maintain our present standard of living has built up a great sense of value in tools and tool materials. Tool steels are carried in stock to replace broken or worn out tools and to make new tools. In building up tool steel inventories a few general procedures must be determined.

(I.) It is no coincidence that with increase in alloy content the cost of the steel goes up and the cost of making the tool goes up. The high cost tool steels, like fine violins, are wonderful in their proper place. However, several characteristics must be considered in selecting a steel for a given tool, otherwise most tools would be made of high speed steel with its superior performance. As it is, high speed steel is almost entirely reserved for cutting tools such as lathe tools, milling cutters, broaches, drill reamers, etc. In this classification, eight distinct types of tool steels are recognized. For practically each type of tool steel there is a choice of many steels, some low in alloy and some high in alloy.

The alloy content of a tool steel should not be confused with the quality; for each type of steel may be high or low in alloy and also high or low in quality. In line with the purpose of this article, which is to classify the tool steels in most common use, the highest quality steels are listed in Table I, and they will generally be found to be the lower alloy steels for each type included. The relative costs of the tool steels is included in the same table.

o o o

By DONALD E. RODA

Tool Foreman and Metallurgist, Rochester Products Division, General Motors Corp., Rochester

o o o

(II.) A second factor that is always kept in mind in building up a tool steel inventory is having the proper size bars for the tools to be made. Yet, the amount of money tied up in steel should be kept as low as possible. Therefore, the more uses that a certain type of tool steel can be put to, the fewer the steels needed and the greater the variety of size that can be carried in stock. This is one of the important features of the group of steels in Table I. For example, only one well rounded high speed steel is included from the many types available. Such tool steels in a large number of sizes will be of more value to the manufacturer than a large number of special purpose steels in a few sizes.

(III.) Another point for serious consideration is that of tool steel brands. Should a certain type of tool steel be of all one brand, or is it all right to obtain the same type of steel from several tool steel makers? This, like other generalizations, is a matter of opinion; however, in favor of sticking to one brand is the argument that there are properties inherent to each brand of steel with which the tool makers, designers and hardeners become acquainted and make use of to make better tools. One example that is often found where this idea is carried too far, is the man who wants to make all kinds of tools out of one brand of steel. Where a piece of steel is ordered for a special tool, it may well be of any brand and every one concerned should be notified; however, bars for general

tool making should be all of the same brand or brands that are known to be very similar.

(IV.) A fourth item that greatly influences a set of working tool steels is the heat treatment. It has a bearing on every steel included in the classification. The most obvious example is the difference in practice of hardening molybdenum high speed steel and the tungsten high speed steel. One manufacturer might be set up for hardening one type and another manufacturer the other. Obviously, the manufacturer must select the type of steel he is prepared to harden.

The 18-4-1 type of high speed steel is included in this classification of tool steels because at present it is easier and less expensive to harden than the molybdenum type. Other reasons for selecting the 18-4-1 type of high speed steel instead of one of the other types of tungsten high speed steel are given in other parts of this article.

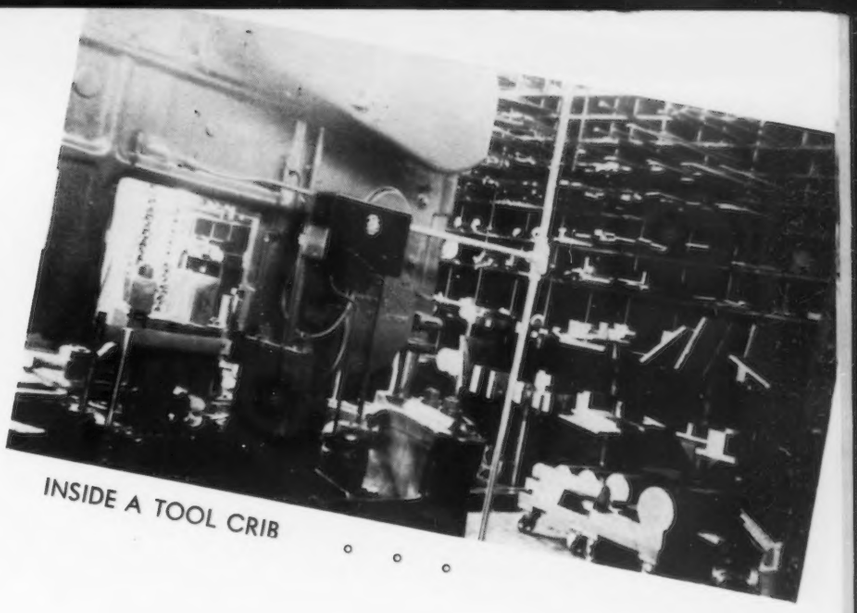
All of the steels in the following classification are old standbys. Although there might be changes in the steels listed in the future, the types included will probably remain the same. The number of steels that can be substituted in any type is already phenomenal. For example, 30 different analyses of high-carbon high-chromium tool steels are listed in Table V, in an article on "Steel Standardization", by A. L. Hartley in the Sept. 14, 1940 issue of THE IRON AGE, and there are many more besides this representative group. One need not be concerned about this large number of steels, for it is only necessary to select one good, well suited steel and stick to it. Herein a selection is already made for each type in the classification and the reasons for the selection are given later. However, each tool room must determine which steels are best suited to its own needs.

Table I is divided into two main divisions, brine hardening tool and die steels and oil hardening tool and die steels, not because of the hardening medium, but due to physical properties inherent to the steels of these groups. Thus, if a piece of tool steel will harden on the surface when cooled slowly, as in oil, it will harden deep compared with brine hardening steels, for more time is allowed for the heat from the center of the tool to be conducted to the surface and into the oil quenching medium than when brine is needed to harden the

TABLE I

Classification of the Tool Steels in Most Common Use According to the Main Reason for Using Each Steel

Steel No.	Type of Tool Steel	Analysis of Major Alloy Elements, Per Cent	Main Reason for Using Each Steel	Rockwell C Hardness	Relative Cost	Quenching Medium	Properties Inherent to Type of Quench
(1)	High-Carbon Plain-Carbon Tool Steel	1.2 C 0.2 Mn	Maximum Rubbing Wear	65	1.0	Brine	Subject to distortion in hardening. Susceptible to hardening cracks.
(2)	Plain-Carbon Tool Steel	1.05 C 0.2 Mn	All Purpose Tool Steel	63.5	1.0	Brine	May be hardened all over or just on the working surface and the remainder toughened.
(3)	Carbon-Vanadium Shock Tool Steel	0.9 C 0.2 Va 0.2 Mn	Increased Shock Strength; Maximum Shock Strength	62 58	1.1	Brine	Harden through in small sections. Shallow hardening in flats over 1/2 in. thick and rounds over 1 in. in diameter. (Hardening approximately 3/16 in. deep.) May be oil quenched and drawn high to Rockwell C 30 to 42 for high strength levers, screws, locks, etc. Not subject to blue brittleness.
(4)	High-Carbon High-Chrome	2.2 C 12.0 Cr 0.3 Mn	Maximum Cutting Wear (of Die Steels)	63	1.8	Oil	Minimum deformation in hardening. Minimum hardening strains and risk of breakage in hardening.
(5)	Manganese Oil-Hardening Die Steel	0.9 C 1.5 Mn	Minimum Distortion in Hardening	62	1.1	Oil	Deep hardening. Must be hardened all over.
(6)	Short-Run Die Steel	0.65 C 0.65 Mn 1.5 Ni 0.7 Cr 0.25 Mo	Low Cost Tool Steel; Increased Shock Strength	60	0.5	Oil	Subject to blue brittleness.
(7)	High-Speed Steel	0.7 C 18.00 T 4.0 Cr 1.0 Va 0.2 Mn	Maximum Cutting Ability Also Ability to Resist Softening at Working Temperatures Over 300 Deg. F.	65 62	2.7	Oil or Air	Air quenched in small sections and in shapes subject to warpage. Oil quenched in other sections. C-20 is the hardness as received. C-67 is the hardness after carburizing and hardening without drawing. C-62 is the hardness after carburizing, hardening and drawing. C-20 is the core hardness. A file hard surface is obtained by cyanide hardening.
(8)	Machine Steel (S.A.E. 1020 or S.A.E. X1020)	0.2 C 0.45 Mn	For Jigs and Fixtures, Used Either Soft or Case Hardened	20 67 62 20	0.25	Brine	



INSIDE A TOOL CRIB

surface. If the steel will harden in air, it will harden still deeper than an oil hardening steel.

Many other differences exist between these two groups of steel. These differences are listed in Table I and will all be considered later on. Besides the two main divisions, two other steels are included which have properties of such a nature that they do not fit into either group. One is machine steel and the other is high speed steel.

Enough steels are included in this group to make any tool; however, when a sufficient quantity of a certain type of tool is to be made, a special purpose steel might be obtained that will be satisfactory and less expensive than the steel which would have to be selected from this group of tool steels. Deviations from the steels given should not be necessary unless the design of the tool or part or production requirements per tool are unusual. Since the tool room has little control over these items, many difficult tool problems that are too specialized to be considered here, are solved by special steels or heat treatments. Other materials are used by tool rooms including copper, spring wire, cast iron, carbide cutter materials, transite, stainless steel, aluminum etc. However, their uses are specialized and are not included in the tool steel classification. The steels are numbered in Table I from 1 to 8 for ease of further discussion and comparison.

Brine Hardening Steels

For the steel with the extremely hard and slippery surface, 1.2 per cent carbon tool steel is widely used in place of other high alloy steels available for the same applications for the following reasons: Performance of steel No. 1 for resistance to rubbing wear, picking up, and holding a good cutting edge is superb. It is slightly more susceptible to hardening cracks than steel No. 2, the plain carbon tool steel, and is subject to distortion; however, rehardening drawing dies to shrink them to compensate for wear is common practice, so distortion is not necessarily a disadvantage.

The similarity of steels Nos. 1 and 2 in machining, hardening and behavior is a great advantage because the tool maker's experience is doubled. For general tool making and maintenance, any slight increase in performance of the high tungsten alloy tool steel commonly recommended for an extremely hard surface is more than offset by increased difficulty in machining, hardening and especially difficulty of grinding this tool steel at the high hardness of Rockwell C-65. Even steel No. 1 must be ground much more carefully than steel No. 2. Since tungsten is a very expensive metal, steel No. 1 is also much less expensive than the tungsten type. Higher carbon tool steels than 1.2 per cent C are used for files and razor blades, etc. However, 1.2 per cent carbon steel is the highest carbon content that may be skillfully hardened without breakage in the more complicated shapes of tools and dies.

The properties of steel No. 1 make it especially well suited to compound blanking and drawing dies to hold a sharp cutting edge and not pick up or wear on the drawing surfaces. For blanking or drawing the softer metals such as copper, where there is much greater tendency to pick up than with steel, this type of steel gives the best performance. A comparison of steels Nos. 1 and 2 shows that steels Nos. 1 and 2 are very similar to the designer, tool maker and hardener. Steel No. 1 is slightly harder than steel No. 2, and conversely steel No. 2 is slightly tougher than steel No. 1.

The third water hardening tool steel is almost a plain carbon tool steel with less carbon for maximum shock strength; however, a small amount of vanadium helps keep the grain fine and thus promotes toughness.

Plain carbon tool steel, as indicated on the chart, is a steel containing 1.05 per cent carbon—it is not one containing 0.1 or 0.2 per cent more or 0.1 or 0.2 per cent less C. This steel is still the most remarkable steel obtainable, combining hardness and toughness for good performance. Upon this firm foundation tool steel reputation has been built and tool making has developed. Obviously a survey of the tool steel catalogs shows that any kind of tool can be made from this steel; however, other tool steels have been found to possess distinct advantages for certain tools.

For example, one of these steels has become known as oil hardening die steel, because it distorts less in oil hardening than carbon steel does in brine hardening and is, therefore, much better suited to dies that should hold their shape. But still, a further survey of present tool steel catalogs reveals that many tools can be made from any tool steel, which does not help select the right steel. There are very definite advantages of the half dozen type of alloy tool steels in common use for certain tools over carbon tool steel. Outside of knowing from past experience what steels are used for the many kinds of tools, an understanding of a few fundamentals of tool steel properties enables the selection of the proper steel for any tool.

Carbon tool steel No. 2, like steels Nos. 1 and 3, has a fundamental characteristic that greatly affects its performance. It hardens with a very hard surface that extends in about 3/16 in. and gradually softens into an extremely strong and tough core. The bonding of the hard outer layer to the core is so strong that the hard surface can not be broken from the tough

core. The tool will fail as a unit first. Thus, where chipping of the edge of a tool is likely to occur this condition is better met by a steel that becomes tougher as the breaking load progresses into the steel, than by a deep hardening steel that remains hard and brittle far in from the surface. Also there is less likelihood of bursting rings or breaking dies in two, since carbon steel can give ever so slightly and absorb an occasional overload without breaking, which deep hardening steels have less ability to do. In small sections plain carbon tool steels harden all of the way through. For these applications, which are many, the characteristics of hard surface and tough core that have made carbon tool steel so famous must be disregarded and the tool considered as a homogeneous hard material.

Steel No. 3 is the last of the very important brine hardening series. It is probably best known as a chisel or shock resisting tool steel. For resistance to chipping and breaking this steel stands supreme and is therefore useful for many tools other than chisels. In discussing steel No. 2, it has been found that the soft core in the brine hardening series promotes toughness. There are many other factors that enter into toughness, one of the most important of which is fillets and uniformity of section. Within the steel, one of the most important factors is actual grain size of the steel carried down to room temperature from the hardening heat. This grain size is easily seen in the fracture of broken tools, for hard materials break around the grain boundaries exposing the grain size. Herein lies the toughness of fine grains, since the smaller the grains the greater the total areas of grain boundaries and the greater the force needed to separate them. The sole function of the vanadium in steel No. 3 is to keep it fine grained. Lower carbon content and hardness also increase the toughness of steel No. 3 over steel No. 2. A comparison of the composition of steels Nos. 1, 2 and 3 shows only a slight change in the major alloying element from the hardest to the toughest tool steel.

The large number of figures listed under chemical analysis in Table I is apt to conceal the slight difference between the hardest and the toughest tool steel, therefore, this information is repeated in Table II in slightly different form.

Because the alloy content of some tool steels runs up to 5 or 10 per cent this does not mean that there is greater freedom in balancing the chemical composition of these steels for the properties desired over the close tolerance in steels Nos. 1, 2 and 3. In fact, the problem becomes much more difficult. Obviously any slight change in carbon content on the surface of a tool in hardening will greatly influence its usefulness unless the tool is ground all over the working surfaces after hardening. Also, it is very important to remove the bark from the outside of tool steel bars and forgings to have the surface of the tool up to the full quality or carbon content of the steel and not slightly decarburized. At least 1/16 in. should be removed from any working surface of a tool steel bar and the larger the bar, the more the amount of metal that should be removed.

The carbon-vanadium steel has found wide use for the tough steel over the many other analyses on the market today because of its high hardness as quenched. It may be used at a hardness of C-62, where only a slight increase in toughness over plain carbon tool steel is required along with a minimum sacrifice of cutting qualities, or the steel may be tempered further to C-58, the usual hardness employed in the shock type of tool steels for maximum toughness in tools where chipping or breakage of tools is likely to occur. With a hardness of approximately Rockwell C-42, the cores of the three brine hardening tool steels are very strong, have high resistance to compressing, and are also very tough. These three steels, especially No. 3, are very useful in the oil quenched condition for high strength tool and machine parts. Oil quenched and drawn to 1000 deg. F., a hardness of approximately C-30 to C-42—depending upon size — is obtained with high strength and toughness. These characteristics are useful for screws, dowel pins, latches, levers and similar parts.

Oil Hardening Steels

Steel No. 4, the oil-hardening high-carbon high-chromium die steel, will hold a sharp cutting edge longer than any other die steel. For this reason it is widely used and has a place in any classification of tool steels. There is no doubt that it will always retain its same position in the tool steel chart and practically the same composition.

Coincident with the advantage of long runs is the disadvantage of setting up fatigue strains in some sections due to the long runs which are likely to cause cracks or chipping of the tool unless these strains are removed by heat treating when the die is removed for sharpening. The tool steel user cannot apply his experience with carbon tool steel to steel No. 4 because there are many differences in physical properties of the two steels. For instance, high-carbon high-chromium tool steel hardens in oil with no practical change in size or shape due to the high alloy content slowing down the transformation rate. In fact this steel will almost harden in air, and hardens all the way through in large sections. Also, the large amount of extremely hard chromium carbide gives steel No. 4 the ability to retain a sharp cutting edge longer than any other die steel but not high speed steel. For the same reason high-carbon high-chromium tool steel is much more difficult to make into tools by machining and filing and to grind after hardening than plain carbon tool steel. Also, the technique of hardening, annealing, tempering, etc., of steel No. 4 is unlike that for carbon tool steel.

There are two air hardening grades of high-carbon high-chromium tool steel (containing about 1 per cent of molybdenum to make them air harden) competing with the oil-hardening grade listed in Table I. They were developed to prevent warpage in sections that

TABLE II

Comparison of the Slight Difference in Chemical Analysis of the Hardest and Most Brittle Steel to the Softest and Toughest Tool Steel

Steel No.	Carbon	Manganese	Vanadium	Silicon	Phosphorus and Sulphur
1	1.20	0.2	0.00	0.2	0.025 max. each
2	1.05	0.2	0.00	0.2	0.025 max. each
3	0.90	0.2	0.25	0.2	0.025 max. each

would cool so unevenly in oil that they would warp in hardening. An example of such a section would be a long thin broach with teeth on one side making a difference in cooling rate from one side to the other. This is not a gain in size, changing the properties of the steel, but decreases quenching strains and warpage. For the same reason the air-hardening type is tougher in some sections due to decreased quenching strains. Oil-hardening high-carbon high-chromium tool steel is difficult to anneal for repair work, but the air-hardening grade is still more difficult.

Steel No. 5, an oil-hardening manganese die steel, is much more like carbon tool steel than steel No. 4. Points of similarity are machinability, cost, hardening and annealing temperatures, grinding and production per tool. The only thing new that tool makers and designers must learn about this steel over carbon tool steel is the main advantage of the steel and that is its non-deforming properties while being hardened. With proper heat treatment, there is no practical size change in hardening a tool made from steel No. 5. With plain carbon tool steel holes close in, bars grow longer and solid blocks bulge on all sides. It is easy to see how steel No. 5 has become to be known as oil hardening die steel, for distortion of die blocks cannot be tolerated. There is slight loss in cutting and wearing properties of oil hardening die steel compared with steel No. 2; however, the loss is very slight and is much less than that occurring from careless hardening of steel No. 2. Oil hardening steels are less susceptible to hardening cracks than brine hardening tool steels, which is important in some instances.

Steel No. 5 is deep hardening except in large sections, where some soft tough core is found. The hard case will be much deeper than with brine hardening steels. Deep hardening is needed for cold forming hard materials with a sharp blow. This steel is intermediate between the shallow hardening brine hardening steels and the two extremely deep hardening tool steels, high-carbon high-chromium and high-speed steel. The applications where the combined strength of the case and core of brine hardening steels is exceeded, causing sinking, are very few. When a deep hardening steel is needed, the tool must be very large in cross-section to have sufficient strength to keep from breaking; if a part is shaped by a squeeze instead of a blow, a deep hardening steel is not needed. In this case, the deep hardening steels will sink just as much as a shallow hardening steel and high hardness is more important than depth of hardening.

There is a similarity in Rockwell hardness testing—the harder the steel, the smaller the impression. Both the Rockwell indentations and the impressions found in the slow squeezing dies show that hardened tool steels have considerable ductility when loaded slowly and uniformly. There are many brands of manganese oil hardening die steel, all of which are good but vary slightly in properties such as cutting ability, deformation in hardening, etc. It is advisable to standard-

A COMPOUND blanking and forming die made of steel No. 1, that makes 600,000 covers for air cleaners each year. A finished part like the sample hanging on the side of the press is made on each revolution of the crank shaft.

MOTOR lamination blanking dies like the ones shown here are usually made of steel No. 4. The above, three dies in one, is being taken apart in the tool room for repairs or sharpening. This die runs 200,000 to 300,000 strokes between sharpenings on 0.050-in. stock.

ize on one brand of steel or similar brands for uniform results.

Steel No. 6 is a good low cost tool steel with remarkable physical properties and the advantages of the oil hardening tool steels. Originating in the open hearth furnace, the cost was low and the cost has remained low in spite of the fact that this steel is now made in the electric furnace. If the price for steel No. 6 increases to equal the other tool steels, there will be little need to carry a separate stock of this steel. Compared with steel No. 5, it is slightly tougher due to analysis and lower hardness; however, cutting ability is decreased with the lower hardness. Steel No. 6 is useful for short-run dies and tool, and for parts of long-run dies and tools that have little tendency to wear. As an oil hardening steel the deformation in hardening is negligible and the depth of hardening is deep. Since steel No. 6 is deep hardening, it does not have as good resistance to shock as the shallow hardening carbon-vanadium steel, No. 3.

High speed steel No. 7 on the chart stands supreme in ability to hold a cutting edge and resistance to rubbing wear; however, it is seldom used for dies due to the difficulty of machining, hardening, and grinding this steel. Since high speed steel is tempered at approximately 1050 deg. F. it has greater ability to retain high hardness when heated in service than any other tool steel. The cutting edges of milling cutters, lathe tools, broaches, drills and other machine tools are subjected to considerable heat in machining metal. For these tools the performance of high speed steel far exceeds the cost of making these tools. Also, for tools and dies that are heated over 300 deg. F. in service *and must retain high hardness* to be useful, all of the advantages of high speed steel can be used and the selection of this steel pays regardless of the difficulty of making the tool. Simple shapes such as knives for chopping up scrap may be made from high speed steel with considerable saving.

There are several types of high speed tool steel, and the one selected here gives the best average of hardness, ability to be machined and ground, toughness for dies, good cutting qualities and ease of heat treatment. A special group of steels called hot work steels have been developed for hot forging dies. Unless a large quantity of these dies are to be made, hot work dies should be made from the more expensive but better high speed steel. This helps to decrease the number of tool steels carried in stock and makes it possible to carry a larger variety of sizes.

Steel No. 8, hot rolled or cold rolled machine steel of the S.A.E. 1020 type, is a soft low strength steel that does not respond to heat treatment. It can only be hardened by some form of case hardening. It is used for tool, die, jig, and machine parts to hold hardened inserts at the working points. Sometimes it is case hardened to resist wear and sometimes it is used soft, although steel No. 8 is not made by or sold by tool steel makers and costs about one-quarter the price of tool steel. Over one-third of most tool steel inventories are made up of this steel.

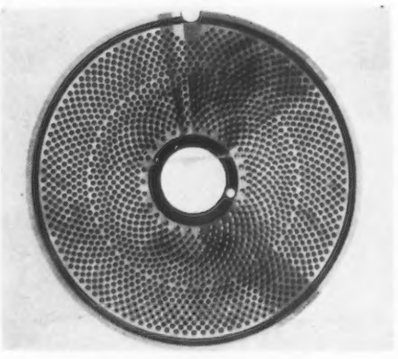
Since S.A.E. 1020 is made in large quantities in the open hearth furnaces, tool steel makers do not compete for this business. No other steel on the chart is so likely to be replaced as No. 8. There are several low alloy steels on the market that are better than S.A.E. 1020, such as S.A.E. X1315; however, they can only be obtained in a very limited number of sizes. Some firms can develop a good business by determining the best low alloy steel to replace S.A.E. 1020 in the tool room at approximately the same cost and having the following advantages over S.A.E. 1020. (1) Ability to be strengthened by heat; (2) better machinability than X1020 for X1020 is by no means good machining; (3) ability to harden in oil after carburizing without distortion, as compared with high distortion from brine quenching S.A.E. 1020 carburized steel. Made in the open hearth to keep the cost down and cold rolled to all sizes carried in 1020, there would be a big future for such a steel.

Some of the inherent tool steel characteristics have not been discussed such as temper brittleness. They will be covered in their logical place in an article on tool hardening in next week's issue of THE IRON AGE.

Drilling Time Reduced 54 Per Cent for Disks

KORRECT KUTTING MFG. CO., of Glen Ellyn, Ill., operating at capacity making meat grinder plates and knives, experienced difficulty in drilling holes in meat grinder disks, due to the metal breaking out from between the holes in the disk.

Since multiple drilling proved impractical because of the closeness of the holes, they are template drilled with a high speed drill. After several low carbon steels were tried with varying degrees of success, Speed Case (X1515), a free machining, fast carburizing open hearth grade, made by W. J. Holliday & Co., Hammond, Ill., was found to perform excellently in this operation.



THIS metal disk meat grinder is made of Speed Case X1515 steel, a manganese and sulphur open hearth grade plate that hardens with a minimum of distortion and cuts grinding time.

On an 8¾-in. disk, by using Speed Case the manufacturer reduced drilling time 54.5 per cent. It is said that facing time was reduced 41.25 per cent and because of the free machinability of the steel, drill breakage and wear were cut almost in half, reducing drill costs about 93.75 per cent. The metal wall between the holes in the disk broke out only in isolated cases, reducing rejects to a minimum.

Heat Treating Aircraft Gears

By JOHN L. BUEHLER
Partner, Indiana Gear Works, Indianapolis

MAINTAINING accuracy on intricate, fragile aircraft engine gears through many mechanical and metallurgical operations presents a set of difficult problems that no fabricator of such parts has failed to encounter—many times with almost disastrous results. In a paper presented before the annual meeting of the American Gear Manufacturers Association in May, the author discussed some of the interrelated methods his company used to solve them. The metallurgical aspects of the problem are treated in this lengthy abstract and present some novel solutions of a multitude of difficulties.

AIRCRAFT engines are built like buggy whips or fly rods. Almost every part is built to deflect with shock load rather than to withstand it. As a consequence the factor of safety is about the same through all sections of a complex part, and any point containing a tool mark, a scratch, a sharp corner, or a chemical or metallurgical segregation, will probably fail in service due to stress concentration and fatigue. Similarly, any bearing misalinement, spline eccentricity or keyway twist will set up unpredictable loads, possibly on adjacent parts, thus greatly enhancing chance for failure. Wall sections are usually thin and a little arc or runout in a long oil hole, for example, will cause a great reduction in section of one side of the shaft wall.

Until recently, every aircraft engine manufacturer had his own variants of S.A.E. steel standards, narrowing the automotive limits for chemical properties and specifying close limits for grain size, cleanliness and hardenability. Many of these standards are still in use, but most engine builders have adopted the new Aeronautical Material Specifications. A.M.S. steels are in general closely controlled variations of S.A.E. materials. However, as there are almost no warehouse stocks of A.M.S. steel, it is necessary to buy mill heats or wait for a pouring, and even the more popular analyses cannot usually be secured on A-1-b or A-1-c priority in less than 14 to 36 weeks. And then they stand a good chance of rejection by the mill, by the Army or Navy, by the gear maker, or by the engine builder.

As a general practice, before we release material for shipment to us, we require a mill to furnish a foot of each bar size from each heat. We then make a deep etch, a McQuaid-Ehn test, a magnaflux test, a pull bar, and a step hardenability test before taking delivery.

Because most aircraft engine parts are extremely light and fragile, distortion in heat treatment presents a serious problem. As a consequence considerable machining has to be done on material in the hard state. Standard production methods of machining to grinding stock, copper plating for selective carburizing, cutting, carburizing and hardening and finish grinding, meet only too often with bleak disaster. Each intricate part must be treated as a special case, and a complex and usually quite unorthodox method must be worked out for it.

Obtaining basic finishes in hard alloys in thin webs, large radii, and deep chamber bores, without chat-

ter, tear, or toolmarks, so that perfectly smooth polish may be obtained without dimensional change, is another serious problem. Of equal importance is the necessity for maintaining control surfaces which will not be affected by distortion in heat treating, from which final hard machining operations can be performed true with operations which were conducted in the annealed state. There is an ever present battle against nicks and scratches in handling. One mark on a non-functioning surface is sufficient cause for rejection.

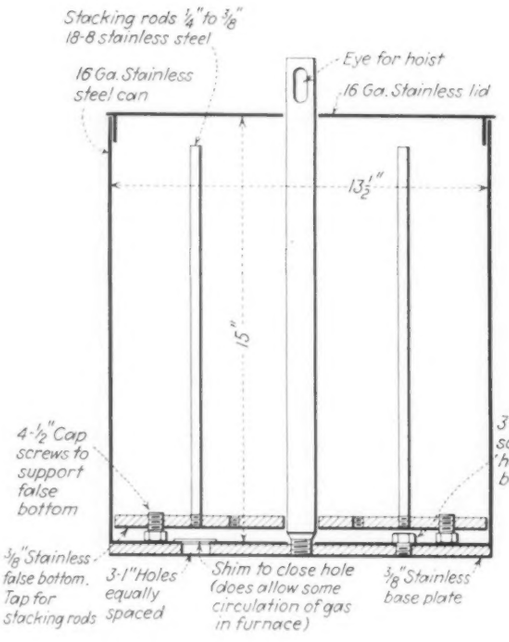
Smoothness Paramount

Smoothness in gear teeth is often a more vital concern than accuracy. As gear cases are made of aluminum or magnesium alloy of very thin section, housing deflection and difference in thermal coefficient of expansion are conducive to considerable change in backlash. Due to engine and shaft frequencies, variable loads are introduced, which in many applications cause pounding. If there is present a toolmark on scratch or grinding check, this is a fatigue point from which spalling may start. If there is a pinhole due to oxidation in heat treating or other cause, tooth action will roll oil into it, generating great hydraulic pressure about the grain boundaries of the material and pitting will ensue.

In general, where gears can be ground, they are. But many internals, clusters and straight cut bevels are unavoidably used and many are not grindable by present practical methods. Many times spurs or helicals, which cannot be ground are made of oil-hardening steel and treated to 50-52 Rockwell C, using a long tempering cycle, producing sorbitic precipitation at the grain boundaries. These gears can be shaved. Often we finish cut at that high hardness on the Fellows gear shaper, removing up to 0.020 in. on a side, with ordinary high speed steel cutters and obtain excellent finishes.

Gears which carburize must be cut in a fairly soft state. Annealed or normalized steel, however, cannot often be cut satisfactorily, particularly if the material has a banded structure. Grains or bands of pearlite tear out and roll under the tool, while "gummy" ferrite builds up on the tool. The resultant streaks are never acceptable.

Our heat treating practice on carburizing steel for maximum machinability usually involves quenching in oil after an hour's soak around 1500 deg. F., then tempering at from 800 to 1200 deg. for several hours, depending on the analysis of the material. The result is a finely spherodized sorbite, homogeneous and "crisp," that machines with clean hard chips that spring away and do not mar the tooth surfaces. Hardness is 23-24 Rockwell C.


Stacking rods ¼" to ⅜" 18-8 stainless steel
16 Ga. Stainless steel can
Eye for hoist
16 Ga. Stainless lid
13½"
15"
4-½" Cap screws to support false bottom
3-½" Cap screws to hold on base
⅜" Stainless false bottom. Tap for stacking rods
3-1" Holes equally spaced
Shim to close hole (does allow some circulation of gas in furnace)
⅜" Stainless base plate

THIS parts container for hardening small gears is used to prevent discoloration and formation of paper thin scale in the brief interval during transference of load from controlled atmosphere furnace to the oil quench tank. Gas in the can condenses and allows the oil to rush in past the shim stock seals in the bottom holes.

Heating Rate Important

Almost all aircraft engine gears must be hardened without producing pits, scale, decarburization or serious distortion. Only the most accurate of heat treating equipment is at all suitable. Heating rate must be carefully controlled. In general practice, most of the distortion that is blamed on the steel, on improper quench, on machining strains and many quaint, obscure other causes occurs principally in heating. As steel heats, it expands. This expansion proceeds at a rather uniform rate until the Ac_1 line on the iron carbide diagram is reached. As the steel is further heated, it contracts until such time as the Ac_3 line is reached. After that, further heating produces expansion. Therefore, if a piece with appreciable variation in section thickness is heated too rapidly, the heavy sections are still below the critical range and expanding, medium sections are in the critical range and contracting and thin sections already fully in solution will be expanding. If the simultaneous expansion and contraction is severe enough to load the material beyond its hot yield point, a permanent set occurs and the material is warped. On cooling, when the material is at equal temperature throughout, parts that have been stretched by distortion will be under compression, and parts that have been hot compressed will be too short and will be under tension. Thus the part will be internally preloaded. If the internal load is greater than the ultimate strength of the part, it flies apart in the quench or shortly after. This is not the fault of the quench in any typical case, as the material does not go through a critical period in quick cooling and hence does not have some sections contacting and some expanding.

The answer is slow and uniform heating, preferably cutting off the heat during the transformation stage so as to get a soak at this time. If a difference of no more than 5 or 10 deg. is maintained between thick and thin sections during heating, little distortion will occur in fragile parts and no quenching press or fixture need be used. Such means are not infallible on fragile parts anyhow, as they can easily prevent the natural ther-

mal contraction of the part, thus stretching it.

However, some distortion does occur in some parts during quenching. This, with high alloys, can greatly be mitigated by quenching on a falling heat. As material starts to furnace cool, it may drop several degrees before any structural change begins to occur. With high alloys the lag is considerable. Thus, it is possible to heat steel until the desired structure is obtained, then let it cool in the furnace to the lowest point at which the structure will be retained, before quenching. The quench will then be less drastic. For example, maximum refinement, maximum hardness, maximum physical properties and minimum distortion in a number of representative steels can be produced by treating as follows:

Material	*Heat to*	*Quench at*
SAE 4140	1425 deg.	1325 deg.
SAE 3312	1450 deg.	1175 deg.
SAE 2512	1420 deg.	975 deg.
SAE 4340	1425 deg.	725 deg.

The above data do not apply to furnace temperature but to actual work temperature. No accurate work can be done unless a thermocouple actually touches the load. We use Leeds & Northrup Vapocarb equipment for hardening and are able to record both temperatures of the work and of the furnace wall, and to control their difference.

As steel transforms from the annealed pearlitic condition through austenite to the final martensite of the hard state, a volumetric change occurs. This volumetric change is in part dependent upon quenching temperature. Most alloys have a tendency to grow when quenched from a high temperature and to shrink a little when quenched near the recalescent point. By playing with this variation it is possible on many parts to avert volumetric change almost entirely by varying the quenching temperature. No sensitive hardening can be performed in accordance with handbook rules. Critical points on various heats of steel of the same nominal analysis may vary 50 deg. A time-temperature diagram should be made on a coupon from each mill heat, charting the AC_1, the AC_3 and the Ar_1 points before any fragile parts from that heat are hardened.

Shielding Necessary

For hardening, we use a very slightly carburizing and very lightly reducing atmosphere. To prevent discoloration and paper scale forming during the transference of work between hardening furnace and oil quench tank, shielding is necessary. We use a container like that illustrated. A can of 16-gage, 26-20 chrome nickel alloy rests on a $\frac{3}{8}$-in. plate of 18-8 stainless. Bottom plate and can have three coinciding 1-in. holes. Over these is laid shim stock. The load rests on an inside false bottom which has a number of tapped holes into which stacking spikes can be screwed. The lid fits loosely enough to allow slow circulation of furnace atmosphere. On quenching, the oil knocks away the shim stock, and gas in the can condenses, creating a vacuum. Oil fills the can almost instantly. The thermal circulation is great. The lid lifts with the rising oil current.

We experience no loss of hardness with this method and find a more uniform circulation than can be obtained by any other method. On repeated quenching the can warps a little and occasionally cracks. If it is kept straight and the cracks welded with 18-8 rod, the work comes out clean and bright and in the drawing operation will take the blue or straw temper color, depending on the draw temperature.

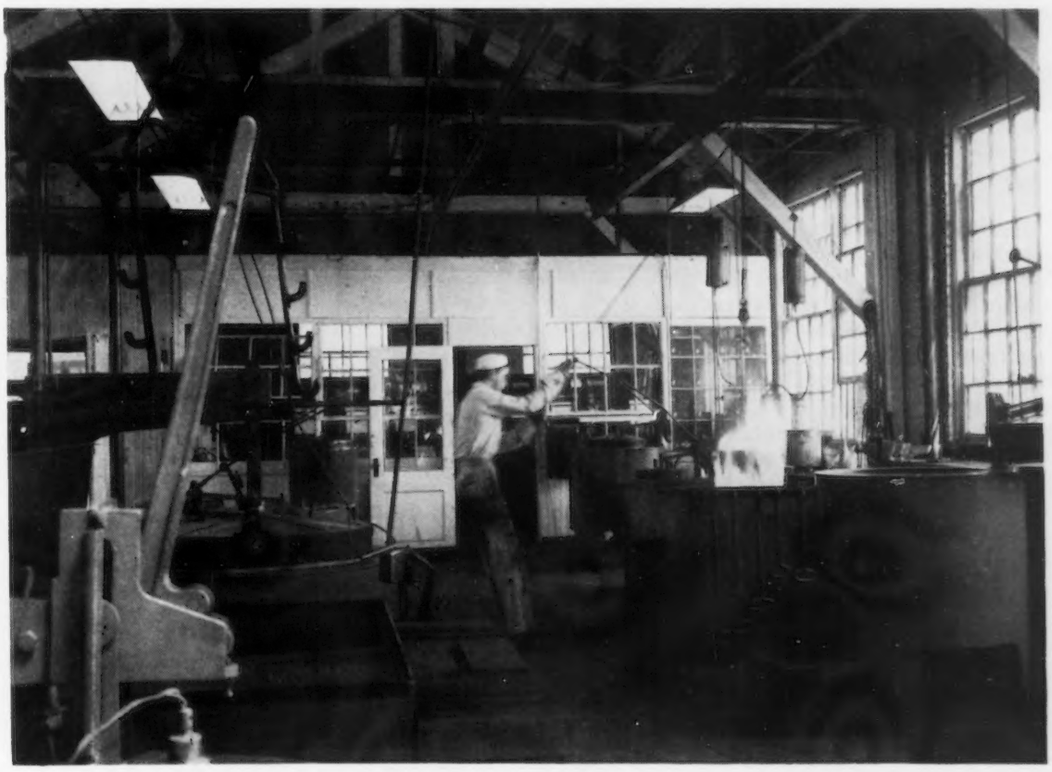
Gas Carburizing Favored

We find only gas carburizing satisfactory, particularly on medium and high alloy steels with an austenitic tendency. Box carburizing is wholly inaccurate. On heating, no one can say when a given batch of compound will crack and

o o o

QUENCHING parts in the special container shown in the line drawing. Hydrocarbon gas is seen burning around the lid as oil enters the holes in the bottom of the container. Furnace is at the right, with lid swung back.

o o o



start carburizing, or on cooling, when carburizing will cease and the compound become a strong active decarburized to destroy the valuable hyper-eutectoid skin on the parts. No one can predict the carbon content or depth of a case produced in this manner until the box is open.

About six years ago we recognized the need for definite standards for case carbon content. We were just beginning to realize that only a very narrow range was satisfactory—that a little too much carbon in alloys with 3½ to 5 per cent nickel produced retained austenite —that the case would not be sufficient to allow peak hardness. The International Nickel Co. generously lent us the very comprehensive data they were accumulating on hardenability and various other properties of 5 per cent nickel steel of from 0.08 carbon to 1.40 per cent carbon. With this excellent material as a background we found that we would have to keep our outer case carbon content between 0.70 and about 0.90 carbon.

Production carburizing of this type can only be done under laboratory conditions. As the load is heated to the carburizing temperature, the atmosphere *must* be kept neutral. At the moment carburizing temperature is reached, an atmosphere empirically predetermined for the given steel, load density, desired case depth and carbon content is applied. If the load is to carburize for, say, two and a half hours, then at the end of two hours we remove one of several included test coupons from the furnace through a suitable small opening.

This we immediately examine in the laboratory for case depth and approximate case carbon content by metallographic analysis. If the load has carburized too rapidly we stop it immediately. If it has carburized too slowly more time can be allowed. If the carbon content is too low, the atmosphere can be enriched. If it is too high, the atmosphere can be made almost neutral as the carbon diffuses.

We believe that under no circumstances may delicate parts be quenched from the carburizing temperature. A cooling pit should always be used—one which will allow the load to cool sufficiently slowly to be machinable in subsequent operations, but not so slowly that the case will diffuse.

We feel a double quench is never desirable. The core on highly stressed parts must always be in complete solution. No free ferrite in the core is ever permitted by the U. S. Army Air Corps. For maximum over-all refinement, quenching on the falling heat a few degrees above the Ar_3 point of the core as mentioned above is the best we have yet found.

Quenching oil should always be kept above 100 deg. The top limit is usually the flash point of the oil. Very hot oil may cause the loss of a point or two of hardness in low alloys, but is conducive to greater uniformity. Forced circulation of quenching oil is almost never in the right direction. Natural thermal circulation is greatest at the hottest points of a load—where circulation is most needed. Our practice is quickly to submerge the load, then very slowly lower it to within no less than 6 in. of the bottom, without any agitation whatsoever.

Tempering is a very important and often improperly executed operation. The major purpose of tempering is to relieve strain, yet too often it is only used to meet blue print hardness specifications. Strain relief is a function of time and temperature. Hardness is primarily a function of draw temperature and can usually be achieved in a few minutes. Yet strain relief is not complete in thin sections after 5 hr. at 300 deg. F. or after 3 hr. at 500 deg. F. Too often leaving urgently needed parts in a busy furnace for 6 or 8 hr. is considered a prodigal waste of time. Yet one unrelieved strain in one small part can easily cause an engine failure.

Problems of Plastic Mold Design Discussed

IN a brief book, "Plastics Mold Designing," just published by American Industrial Publishers, Cleveland, Gordon B. Thayer, M.E., discusses for the first time the fundamentals of plastic mold design as applied to representative types of compression and injection molds and describes mold sinking methods and product design in relation to mold building methods. Mold terms are defined in a section on nomenclature. This chapter presents what is probably the most complete list on the subject to date and will be revealing to those whose experience has largely been with forging and press dies.

Following the introductory chapters, the book takes up the design of a simple compression type mold and then goes into more complex types. Design principles are stressed, although the descriptions refer to specific but typical molds. The same treatment is accorded to injection molds, beginning with the simplest type and then going into the intricacies of stripper plate injection molds and a loose bar injection mold.

Methods of mold sinking cover hobbing (or hubbing), milling and duplicating. Hobbing is a process of forming a mold by forcing a hardened steel master of the same shape into a soft steel cavity, which is subsequently trimmed to size, carburized, hardened and polished. The treatise is probably the most complete on this comparatively little known process and is followed in a later chapter by a discussion of special hobbing steels and their heat treatment. Another valuable section is a series of four decimal place shrinkage tables, useful where plastic products must be held within close tolerances.

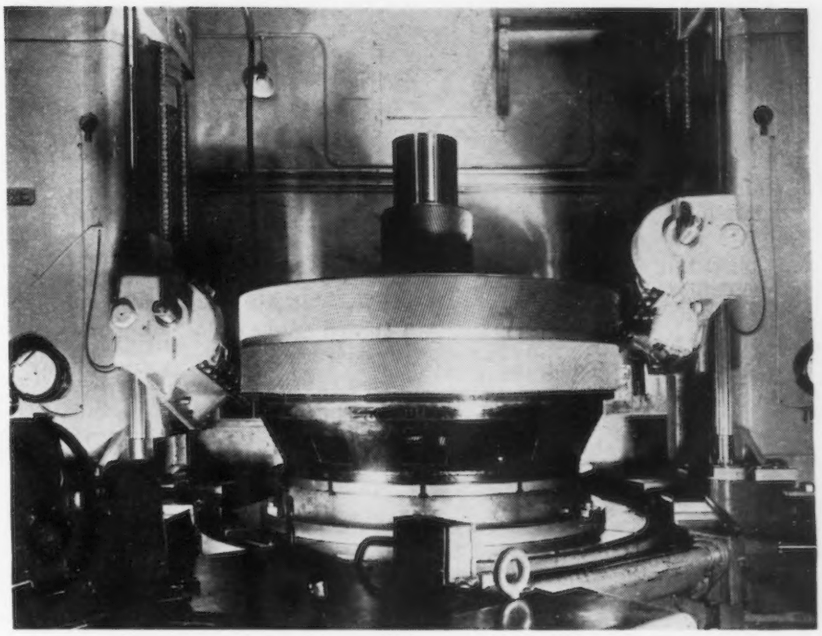
In an introductory foreword, George K. Scribner, president of the Boonton Molding Co. and secretary of the molders section of the Society of the Plastics Industry, comments that his industry depends too much on time and experience today, for which there can be no substitute, but that a sound start in the right direction has been given by this book. His description of some of the specific difficulties molders encounter, however, may cause some of those contemplating getting into this intriguing business to linger on the side lines a little longer, despite all the specific information Mr. Thayer includes in his little book (64 pp.).

Big Hobber for Marine Gears

BACKLASH between the indexing worm and the gear driving the work table is maintained at a minimum by the application of a patented design designated as dual-lead worm gearing, in the new 120H gear hobber designed by Gould & Eberhardt of Irvington, N. J., for the production of high speed marine turbine reduction gears with extreme accuracy on a production basis. The indexing worm is arranged with a different lead on each set of profiles, thereby producing a thread that varies in thickness from one end to the other. By adjusting axially this dual-lead worm with the mating gear which has correspondingly modified teeth, the backlash is controlled without disturbing the center distance and without affecting the transmission of uniform motion. In addition, two sets of indexing worms and gears are used, one set of coarse pitch being used for roughing and the other of fine pitch for finishing, thus preserving the latter's accuracy. Furthermore, by a separate motor drive the coarse pitch worm gear set can be used for turning the table at higher speed for truing gear blanks.

The new gear hobber is arranged with two cutter heads oppositely disposed so that both right- and left-hand portions of double-helical gears may be cut simultaneously, thereby increasing production almost twofold. One head feeds up and the other feeds down. At any time, either cutting head may be disconnected and the machine operated as a conventional single cutter head machine. The hob slides are mounted on separate stanchions, each of which is independently adjustable along its respective bed. The swivel head has angular adjustments of 180 deg. for cutting right- and left-hand helical gears at any angle.

The main gear mechanism and driving motors are located away from the machine proper for thermal isolation in order to prevent distortion of the work through absorption of the heat from the driving elements. This factor is important where large diameter and wide face gears require several days of continuous cutting to finish the teeth in one gear.



FINISH hobbing both halves of a double helical marine propulsion gear simultaneously in the new G & E 120-in. double head gear hobber. Shown installed in the customer's plant, the machine itself is housed in a constant temperature room to assure accuracy of the product.

Eleven motors are used to operate the machine. Six of them are d.c. and the remaining five a.c. In the event of a power interruption, automatic switches connect the d.c. motors to a standby storage battery, thus overcoming the possibility of the machine stopping during a finishing cut and ruining a gear. Also by using d.c. for the main drive motor, a 4-to-1 speed range can be obtained without resorting to change gears. Contrary to the usual practice, thermal overload protection for the main drive motor has been omitted and a horn signal device is submitted to warn the operator when the motor is overloaded. This permits slowing down the motor without interrupting the cut, while the cause of the overloading is being determined. Lubricant and coolant motor-pumps also run from the storage battery equipment should the main power supply be interrupted and these units are supplied in duplicate to guard against failure during a cut.

Stanchions are traversed by a.c. motors, which operate only when their respective pushbuttons are depressed. On top of each stanchion there is a 5-hp. motor for independently positioning the cutter heads vertically and in addition there is 20-hp. motor used to simultaneously traverse both heads and maintain the lead relation to each other and the gear blank. The same motor is also used for rapidly traversing the hobs in opposite directions upon completion of the cut. Handwheels and resetting clutches are used when positioning the hobs at the start of the cut.

The accumulated error in lead is within 0.001 in. in 4 ft. The average periodic error corresponding to one revolution of the index worm does not exceed 0.00005 in. on a gear 120 in. in diameter and the accumulated pitch error is less than 0.002 in. on the same size gear. The machine has a nominal capacity of 120 in. diameter, 48 in. face width at 45 deg. and 2½ diametral pitch, but at low helix angles will accommodate gears up to 160-in. diameter.

Relations between

Microstructure and

IT was pointed out last week how microstructure influences machinability ratings, and how there are wide differences of opinion regarding these influences. Herein, definite data are experimentally determined to clarify this important problem.

To definitely establish the relationship between the microstructure and the machinability of the oil hardening alloy steels mentioned last week, nine bars of electric furnace steel measuring 1¾ in. in diameter were obtained. Three of these bars were of S.A.E. 3250 steel, three were of S.A.E. 4350 steel, and three were of 6150 steel. All the bars were heat treated as indicated below:

Bar No.	Grade	Treatment	Brinell Hardness
1	3250	pearlite-annealed	187
2	3250	spheroidize-annealed	184
3	3250	quenched and tempered (spheroidized)	188
4	4350	pearlite-annealed	203
5	4350	spheroidize-annealed	185
6	4350	quenched and tempered (spheroidized)	197
7	6150	pearlite-annealed	175
8	6150	spheroidize-annealed	156
9	6150	quenched and tempered (spheroidized)	166

Chemical analysis of these three grades of steel showed the following:

Grade	C	Mn	P	S	Cr	V	Ni	Mo
SAE 3250	0.47	0.44	0.017	0.012	1.0	...	1.81	...
SAE 4350	0.47	0.65	0.015	0.020	0 84	...	1.80	0.20
SAE 6150	0.50	0.59	0.018	0.016	0.95	0.19	...	...

The physical properties of these steels in the as-received condition were as follows: (Tensile test bars machined from center of each bar.)

Bar No.	Tensile Strength	Yield Strength	Elongation, Per Cent in 2 in.	Reduction of Area, Per Cent	Brinell Hardness
1	100,000	51,250	23.5	50.1	187
2	87,400	52,100	31.5	62.7	183
3	94,250	52,500	28.5	58.6	187
4	103,500	54,300	24.0	46.1	203
5	99,750	49,100	26.0	50.4	185
6	101,000	55,600	26.2	49.9	197
7	83,500	43,300	31.0	60.2	175
8	79,800	41,250	33.5	63.3	156
9	82,000	56,800	34.5	68.1	166

Each bar was microexamined for the character and type of structure. Photo-micrographs at 750 magnification of each bar are shown in Fig. 3. It will be observed that laminated annealed bars showed a pearlitic structure, the spheroidized-annealed bars showed globules or spheroids of iron carbide (cementite) in the coarse ferrite matrix, while the quenched and tempered bars showed small spheroids of an iron carbide in a fine-grain ferrite matrix.

Each bar was machined for 1 hr. in a No. 6 Brown and Sharpe automatic machine with tools set for center drilling, drilling, forming, counterboring, reaming and cutting off operations. All tools were made from 5 per cent cobalt high speed steel, except the drills which were made from standard high speed tool steel. The spindle speed was set at 343 r.p.m. to produce 12 gear blanks per hr. Eccol-Kut 1-X sulphur base cutting oil was used as the lubricant. After each bar was machined for 1 hr., the tools were reground and redressed so that each bar would be machined under exactly the same and equal conditions.

The machinability rating of each bar can be satisfactorily obtained from the character of the chips formed from each tool and from the surface appearance of the gear blanks. The character of the chips for each tool and from each bar was as follows:

S.A.E. 3250—Annealed:

Counterbore: very short chips, short coils, somewhat broken up, natural color, very soft.

Forming: very small chips, quite broken up, very soft, natural color, no chips showed full width of tool, short and coily chips.

Centerdrill: light brown, long curly chips, soft.

Drill: long, curly chips, very soft, natural color.

Cut-off: long stringy chips, soft, natural color.

S.A.E. 3250—Spheroidized:

Counterbore: very soft short chips, natural color.

Forming: slightly colored, soft curly chips, short curls.

Centerdrill: deeply colored brown chips, soft, not hard, long curly chips.

Drill: long curly chips, soft, natural color.

Cut-off: soft, string and long chips, no curls, natural color.

S.A.E. 3250—Quenched and Tempered:

Counterbore: soft, curly chips, natural color.

Forming: soft, curly chips, natural color.

Centerdrill: soft, stringy, curly chips, very long coils, light brown color.

Drill: long curly chip, soft, natural color.

Cut-off: long curly chip, soft, natural color.

S.A.E. 4350—Annealed:

Counterbore: very soft, curly chips, natural color.

Forming: soft, short coils, scattered and broken chips, natural color.

Centerdrill: curly chip, slightly colored brown, brittle.

Machinability

for alloy gear steels—particularly those steels used in highly stressed aircraft gearing.

By NORMAN E. WOLDMAN
Chief Metallurgical Engineer, Eclipse Aviation Corp.

Drill: soft, curly chips, natural color.

Cut-off: very soft, curly chips, natural color.

S.A.E. 4350—Spheroidized:

Counterbore: very soft, curly chips, natural color.

Forming: very soft, very curly chips, open grain, natural color.

Centerdrill: soft chips, slightly brittle, long coils, straw color.

Drills: soft, curly chips, natural color.

Cut-off: soft, curly chips, natural color.

S.A.E. 4350—Quenched and Tempered:

Counterbore: very soft, long coils, natural color.

Forming: small chips, very soft, very curly, natural color.

Centerdrill: very long coil, very soft, natural color.

Drill: very long coil, very soft, natural color.

Cut-off: one long continuous coil, very soft, natural color.

S.A.E. 6150—Annealed:

Counterbore: very soft, curly chips, natural color.

Forming: very soft, curly chips, not stringy, natural color.

Centerdrill: dark straw color, slightly stiff and hard, small curly chips.

Drill: very soft, curly chips, natural color.

Cut-off: soft, curly chips, natural color.

S.A.E. 6150—Spheroidized:

Counterbore: slight straw color, curly chips, fairly soft.

Forming: very curly chips, dark straw color, not brittle but slightly hard.

Centerdrill: stiff and heavy chips, natural coil starting off small and widening gradually, dark straw color.

Steel		From Forming Tool	From Counterbore Tool
SAE 3250	annealed	fair	fair
	spheroidized	good	good
	quenched and tempered	good	good
SAE 4350	annealed	very poor	good
	spheroidized	fair	good
	quenched and tempered	fair	fair
SAE 6150	annealed	poor	fair
	spheroidized	fair	fair
	quenched and tempered	fair	fair

Drill: slightly brittle chips, very curly, natural color.

Cut-off: very soft chips, slightly curly.

S.A.E. 6150—Quenched and Tempered:

Counterbore: hard, brittle chips, blue color, very short, somewhat curly, breaks easily.

Forming: very hard chips, short curls, brittle coils, dark blue color.

Centerdrill: hard brittle, very long coil, very deep blue.

Drill: very hard, brittle, short chips, no coils, blue color.

Cut-off: very stringy, hard, brittle, chips, very stiff, springy, no curl to chips, blue color.

Fig. 4 shows photographs of typical chips obtained from the nine different bars with the forming tool. The wide difference in the character of the chips from each bar is quite apparent. Fig. 5 shows photographs of typical chips obtained from the nine bars with the counterbore tool. Here the difference in the character of the chips is not so marked as that obtained with the forming tool.

The surfaces of the gear blanks were then examined for character of finish and reported as follows:

The general conclusions for the automatic machining were that of the S.A.E. 3250 steel bars, the quenched and tempered bar machined the best, the spheroidized bar was next in order, and last the annealed bar. The quenched and tempered bar showed softer and longer chips and better curls than the other two bars. The annealed bar machined the poorest, although it was satisfactory. Of the S.A.E. 4350 steel bars the quenched and tempered bar machined the best, the spheroidized bar did not machine quite as well, while the annealed bar was the poorest of the three. The quenched and tempered bar appeared softer and more close-grained than the other two bars. The annealed bar appeared harder and tougher than the spheroidized bar. The gear blanks from the annealed bar were hotter than the cut-off blanks from the other two bars. Of the S.A.E. 6150 steel bars

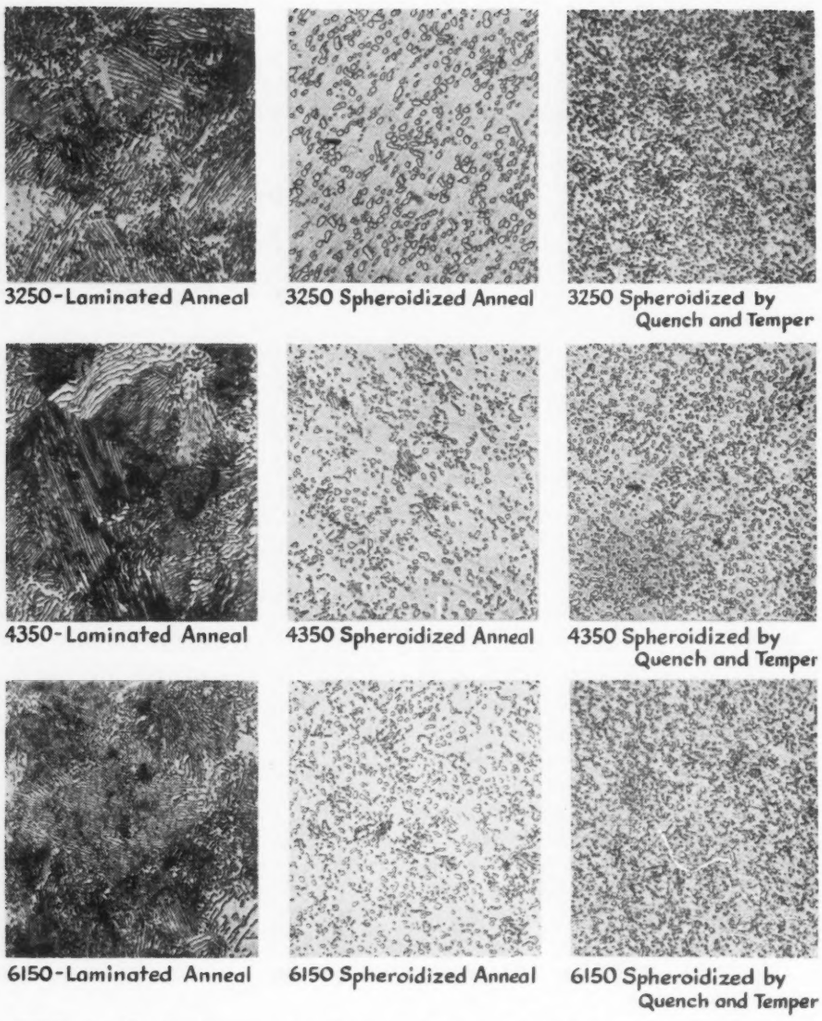


FIG. 3—Photomicrographs of each of the nine test bars in the as-received condition. At 750 diameters.

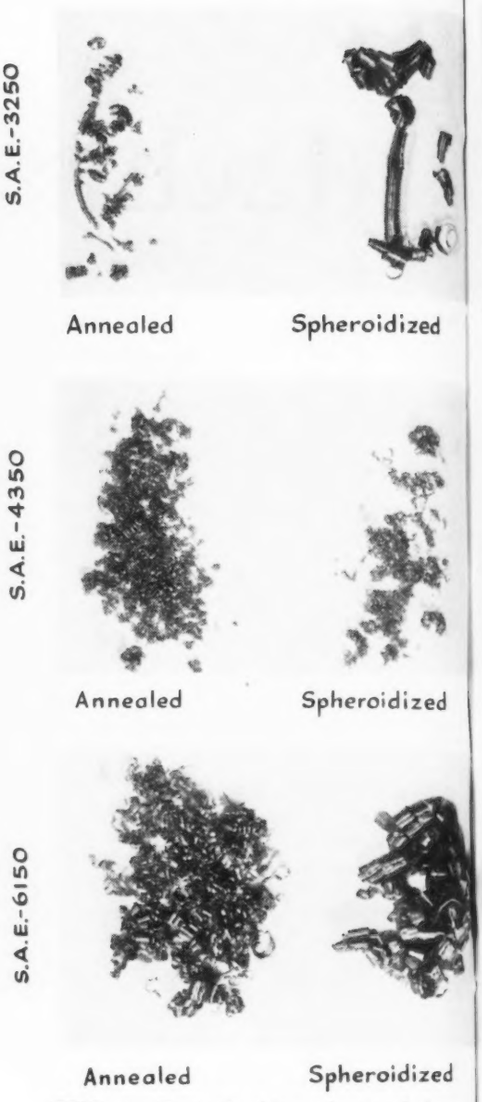


FIG. 4—Typical chips obtained from the forming tools on

the spheroidized bar machined the best, the quenched and tempered bar did not machine as well, while the annealed bar machined the poorest. All three of these bars appeared rather tough to machine in comparison to the S.A.E. 3250 and S.A.E. 4350 steel bars. All the gear blanks from the 6150 steel bars were too hot to hold in the hand, indicating much friction heat developed. None of the tools after the machining of each of the above nine bars for one continuous hour showed sufficient wear to necessitate regrinding or redressing.

To determine the effect of increased speed on the machinability rating, the spindle speed was set at 418 r.p.m. to produce 16 gear blanks instead of 12 gear blanks per hr. The best bar was then selected from each of the three grades of steel for this test. These three bars were the quenched and tempered S.A.E. 3250 steel, the quenched and tempered S.A..E 4350 steel and the spheroidized S.A.E. 6150 steel. After each bar was machined for 1 hr. to produce 16 gear blanks, the tools were reground and redressed as before. The results obtained were as follows:

S.A.E. 3250—Quenched and Tempered:

Machinability good, finish fair, chips were small but of natural color, gear blanks were fairly hot after machining, no noticeable wear on tools.

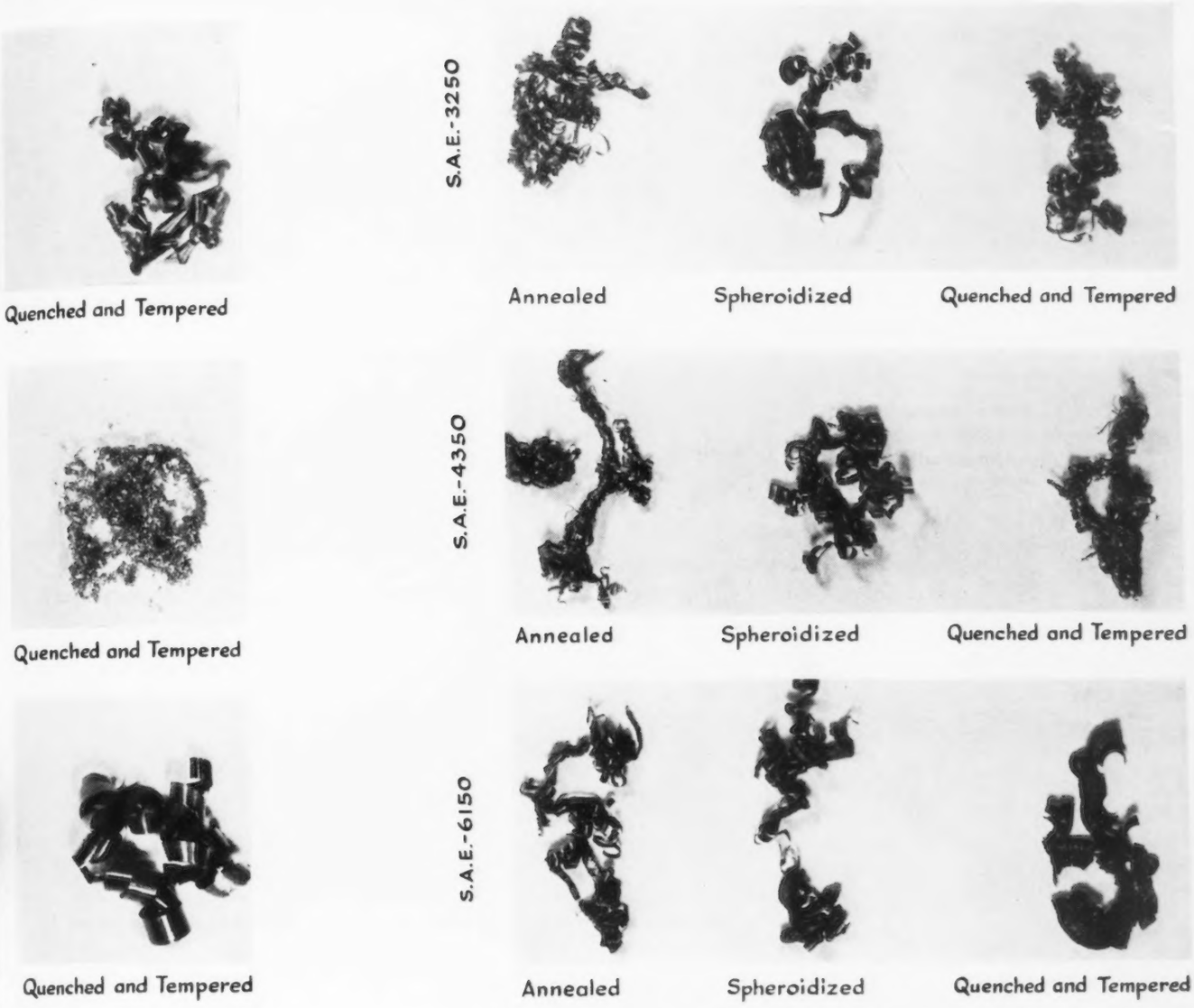
S.A.E. 4350—Quenched and Tempered:

Machinability good, chips finer and softer than those of the S.A.E. 3250 steel, chips natural color, fairly hot blanks but not as hot as those from the previous bar, better finish than on previous blanks, no noticeable wear on tools.

S.A.E. 6150—Spheroidized:

Machinability poor, blue chips, long and tough chips, passable finish but not desired, blanks very hot, tools showed evidence of wear and bluing.

The above tests showed that the S.A.E. 4350 steel bar, quenched and tempered, had the highest machinability rating. It was, therefore, decided to go a step further and increase the spindle speed so as to machine 20 gear blanks per hr. from this bar. This test ran for three continuous hours, at the end of which time the tools showed absolutely no evidence of any wear. The machinability was good with



Quenched and Tempered

Quenched and Tempered

Quenched and Tempered

the nine different bars with automatics.

FIG. 5—Typical chips obtained from the nine bars with the counterbore tools on automatics.

fair surface finish. The blanks were fairly hot to the touch, but not too hot.

The foregoing experiments in the automatics showed that for the S.A.E. 3250 and the S.A.E. 4350 steels the fine, close-grained spheroidized structure obtained by quenching and tempering was best for the automatic machining; while for the S.A.E. 6150 steel the coarse, open-grained spheroidized structure, obtained by a long anneal near the lower critical temperature, was best. The annealed (laminated-pearlitic) structure gave a poorer finish and machined harder and tougher. The quenched and tempered S.A.E. 4350 steel bar had the highest machinability rating of the nine bars.

These gear blanks were then rough broached by placing two blanks back to back on the broach. Carbon tetrachloride was used as the lubricant. The broached surfaces were carefully examined and reported as follows:

		Broached Surface Finish
SAE 3250	annealed	very good
	spheroidized	good
	quenched and tempered	good, slight tears on surface
SAE 4350	annealed	good
	spheroidized	fair, slight tears on surface
	quenched and tempered	good, slight tears
SAE 6150	annealed	fair
	spheroidized	fair, slight tears on surface
	quenched and tempered	fair

The foregoing clearly indicated that the annealed blanks offered the smoothest surface finish with no tears during the broaching operation, while the spheroidized and the quenched and tempered blanks showed slight surface tears and a rougher surface finish.

The next operation was to face the bevels of the blanks with a single point high speed steel tool

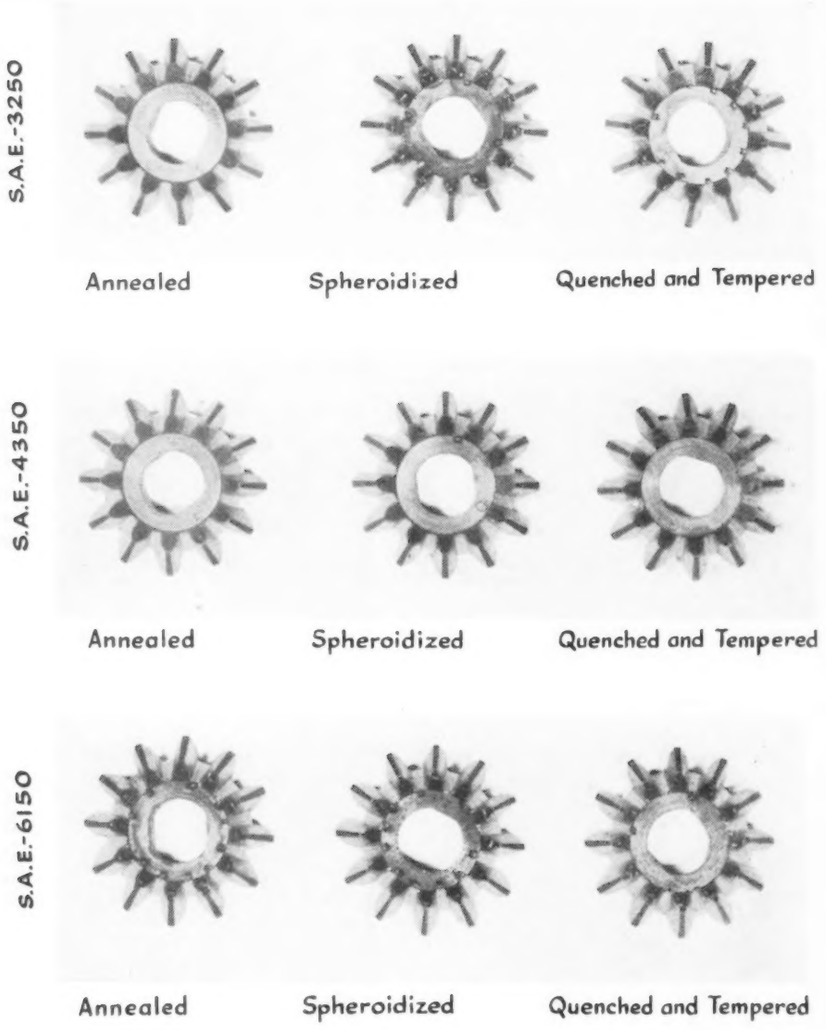


FIG. 6 — Nine gears, one from each of the nine bars, after rough gear cutting.

using as a lubricant a mixture of one-third Quaker-Kut 26 and two-thirds Eccol-Kut 1X. The finished surfaces were as follows:

		Surface Finish
SAE 3250	annealed	very good, smooth surface
	spheroidized	poor, ragged edges
	quenched and tempered	good, slightly ragged edges
SAE 4350	annealed	fair
	spheroidized	fair, scratched finish
	quenched and tempered	fair, slightly rough edges
SAE 6150	annealed	good
	spheroidized	poor, rough edges
	quenched and tempered	very poor, hard, torn surfaces

The foregoing showed that for facing the bevels with a single point tool the annealed laminated structure is best. The spheroidized structure produces a rougher surface with ragged edges. The same tool was used throughout with no regrinds or redressing necessary.

The next operation was rough and finish gear cutting on a 12-in. Gleason gear cutter using a sulphur base mineral oil as the lubricant. The speed was set for 23 sec. per tooth, which was a little higher than the standard rate. This set-up cut 11 gear blanks per hr. The appearance of the gear teeth after rough cutting was as follows:

		Surface Finish of Rough Cutting
SAE 3250	annealed	excellent, clean, no burrs
	spheroidized	poor, rough, heavy burrs
	quenched and tempered	fair, light burrs
SAE 4350	annealed	fair, very light burrs
	spheroidized	poor, heavy burrs
	quenched and tempered	fair, light burrs
SAE 6150	annealed	poor, light burrs
	spheroidized	poor, heavy burrs
	quenched and tempered	very poor, heavy burrs

Fig. 6 is a photograph of nine gears, one from each of the nine bars, after rough gear cutting. This photograph clearly shows the rough surface and burrs developed in the spheroidized and in the quenched and tempered steels, while in the annealed steel it shows a smooth surface and no burrs. The slight burrs developed on the annealed S.A.E. 6150 steel gear blank can be readily accounted for by studying the microstructure (see Fig. 3) of the annealed S.A.E. 6150 steel. Here it will be observed that

this steel is partially spheroidized. Had this steel been properly annealed for complete laminated structure, no burrs would have formed during rough gear cutting. Fig. 2 shows this clearly.

After finish gear cutting, the surfaces were as follows:

		Surface Finish After Finish Cutting
SAE 3250	annealed	good
	spheroidized	poor
	quenched and tempered	poor
SAE 4350	annealed	good
	spheroidized	poor
	quenched and tempered	poor
SAE 6150	annealed	fair
	spheroidized	poor
	quenched and tempered	very poor

The conclusions drawn here are that the annealed steels produce a satisfactory surface finish after rough and finish gear cutting. The spheroidized and quenched and tempered steels produce a rough surface not acceptable to the inspection department.

Distortion Determined

All the gears were finally hardened to 48 to 52 Rockwell C to determine the variation in distortion between the different lots of steel. The annealed, spheroidized and quenched and tempered S.A.E. 3250 gears were hardened by placing all in one furnace, heating slowly to 1450 deg. F., holding at 1450 deg. F. for 10 min., quenching in oil and tempering at 575 deg. F. for 1 hr. The annealed, spheroidized and quenched and tempered S.A.E. 4350 gears were hardened by placing all in one furnace, heating slowly to 1550 deg. F., holding at 1550 deg. F. for 10 min., quenching in oil, and tempering at 550 deg. F. for 1 hr.

The annealed, spheroidized and quenched and tempered S.A.E. 6150 gears were hardened by placing all in one furnace, heating slowly to 1600 deg. F., holding at 1600 deg. F. for 10 min., quenching in oil, and tempering at 400 deg. F. for 1 hr.

Checking the double dee bore before and after hardening gave a good indication of the relative distortion of the nine lots of steel in hardening. The results obtained were as follows:

	Before Hardening		After Hardening			
	Diameter Flats	Diameter Curves	Diameter Flats Max.	Diameter Flats Min.	Diameter Curves Max.	Diameter Curves Min.
SAE 3250						
annealed	0.5045	0.5635	0.5055	0.5045	0.5640	0.5640
spheroidized	0.5046	0.5638	0.5055	0.5045	0.5640	0.5636
quenched and tempered	0.5045	0.5635	0.5053	0.5043	0.5638	0.5635
SAE 4350						
annealed	0.5045	0.5635	0.5054	0.5043	0.5643	0.5633
spheroidized	0.5045	0.5635	0.5052	0.5045	0.5642	0.5635
quenched and tempered	0.5045	0.5635	0.5055	0.5045	0.5645	0.5635
SAE 6150						
annealed	0.5045	0.5635	0.5052	0.5043	0.5642	0.5633
spheroidized	0.5046	0.5635	0.5045	0.5040	0.5635	0.5630
quenched and tempered	0.5045	0.5635	0.5047	0.5040	0.5637	0.5630

Careful examination of the foregoing figures shows that the distortion of the bores of the nine lots of steel gears is about the same. The spheroidized steel gears show less distortion than the annealed gears or the quenched and tempered gears. The quenched and tempered gears show slightly less distortion than the annealed gears.

Conclusions

In summarizing the results of these experiments, the following conclusions are drawn:

(1) For SAE 3250 and SAE 4350 steels, the quenched and tempered, fine-grained spheroidized structure is best for automatic machining.

(2) For SAE 6150 steel, the coarse-grained spheroidized structure, obtained by long annealing at and about the lower critical temperature, is best for automatic machining.

(3) For all three steels, the laminated-pearlite structure, obtained by annealing above the upper critical temperature, is best for broaching.

(4) For all three steels, the laminated-pearlite structure, obtained by annealing above the upper critical temperature, is best for gear cutting.

(5) For all three steels, the laminated-pearlite structure, obtained by annealing above the upper critical temperature, is best for single point tool turning of the bevel faces of the gears.

(6) The spheroidized structure, obtained by long annealing at and about the lower critical temperature is best for minimum distortion in hardening, the annealed laminated-pearlite structure producing the most distortion.

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(6) H. W. Graham, "Grain Size in Relation to Machinability and Other Properties of Bessemer Screw Steel," Preprint October 1934 Meeting, A.S.M.

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Weld Quality Checked

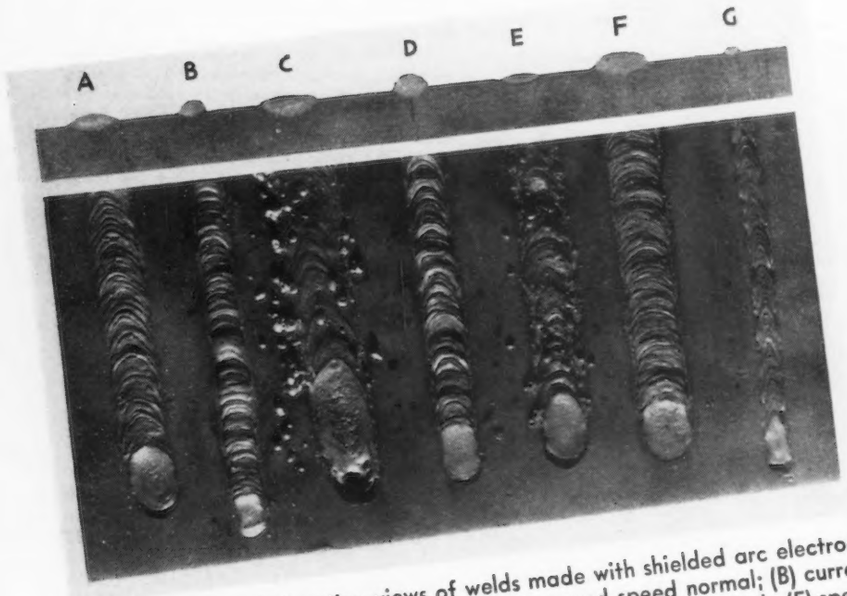

FIG. 1—Plan and elevation views of welds made with shielded arc electrode under various conditions: (A) current, voltage and speed normal; (B) current too low; (C) current too high; (D) voltage too low; (E) voltage too high; (F) speed too low; and (G) speed too high. See table.

Weld Characteristics Under Various Conditions

(See Fig. 1)

	F	A	B	C	D	E	G
Arc current	normal	low	high	normal	normal	normal	normal
Arc volts	normal	normal	normal	low	high	normal	normal
Arc speed	normal	normal	normal	normal	normal	low	high
Burn off of electrode	Normal appearance. Coating burns evenly.	Practically same as preceding.	Coating is consumed at irregular high rate—watch carefully.	Coating too close to crater; touches molten metal, resulting in porosity.	Drops at end of electrode flutter and then drop into crater.	normal	normal
Penetration fusion (crater)	Fairly deep and well defined.	Not very deep nor well defined.	Deep, long crater.	small	Wide and rather deep.	Crater normal.	Small, rather well defined crater.
Appearance of bead	Excellent fusion—no overlap.	On top of plate. Not as much overlap as with bare rod.	Broad, thin bead—good fusion.	High bead not as pronounced as for low amperage; somewhat broader.	Wide—spattered.	Wide bead, overlap large. Base metal & bead excessively heated.	Small bead, undercut—reduction in bead size and undercutting depends on speed and amperage.
Arc sound	Sputtering hiss plus sharp crackling.	Irregular sputtering. Some crackling.	Regular explosive sounds.	Hiss plus steady sputter.	Soft sound plus hiss and few crackles.	normal	normal

VARIOUS methods may be employed in the inspection of welds, the simplest and most expedient being visual inspection. Experience and keen perception of the inspector are requisites. Visual inspection may be considered under the two following groups: (1) inspection during welding, and (2) inspection after welding.

Inspection During Welding: By making a habit of observing the effects of certain variations, that is, in arc current, arc voltage and arc speed, the inspector can become proficient in telling whether a weld is good or bad.

The method to follow in developing the habit is to maintain all conditions save one and note the effect of varying that one condition. The effects to be noted are:

(1) Consumption of electrode—how it burns off, smoothly or evenly.

(2) Crater—its size, shape and appearance of surface.

(3) Bead—its size, shape and fusion.

(4) Sound of the arc.

All observations are made with one of the particular conditions a certain percentage of normal. Having first noted the effect of conditions with all three factors 100 per cent normal, the second step is to vary *arc current* to 50 per cent normal leaving the arc voltage and arc speed both 100 per cent. In the third observation, *arc current* is changed to 150 to 250 per cent normal with the other two conditions still 100 per cent. For the fourth and fifth observations, the arc current is returned to 100 per cent normal and the change made in *arc voltage*, setting this at 50 per cent normal for the fourth and 150 to 200 per cent for the fifth, leaving the arc speed at 100 per cent. The sixth and seventh observations concern variations in *arc speed* with arc current and arc voltage 100 per cent. For the sixth the *arc speed* is 50 per cent and for the seventh 50 to 250 per cent.

Visually

By ARTHUR MADSON
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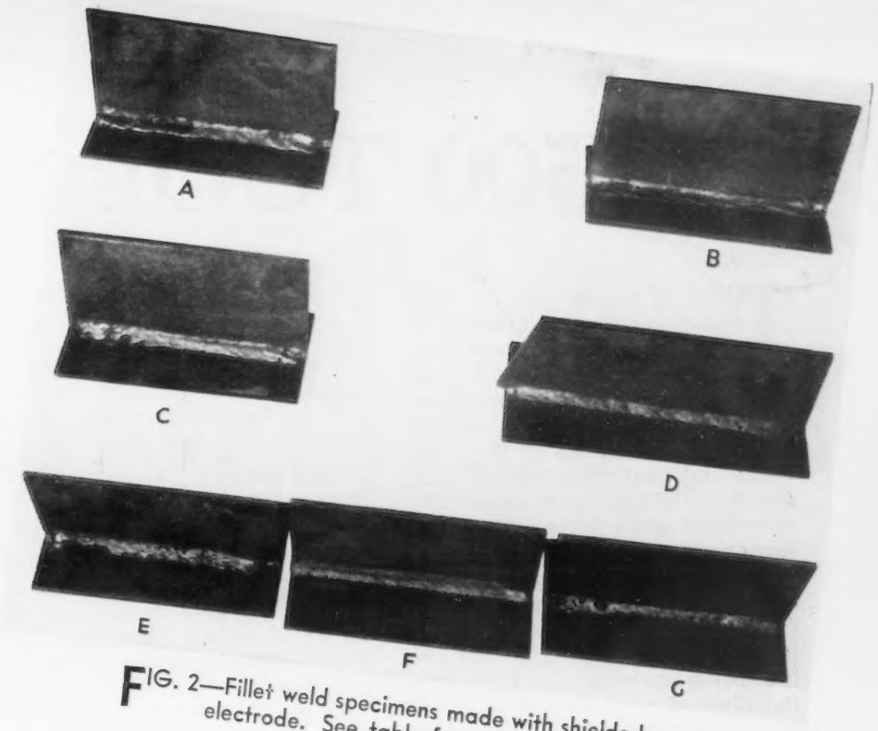

FIG. 2—Fillet weld specimens made with shielded arc electrode. See table for explanation.

A change (from normal) in any one condition will be reflected in some effect on one or more of the four factors. Practice in studying these effects will give the inspector skill in being able to determine where the trouble, if any, may be.

The effects of variation on conditions are more apparent when bare electrodes are used and it is suggested that these be used for the first series of observations. Then use the shielded arc electrodes which are more automatic and less sensitive to adverse conditions, assuring excellent results readily. The method of observation is the same as for bare electrodes.

Inspection After Welding: As in the inspection during welding, certain telltale signs will reveal considerable information to a qualified inspector after the welding is done. Items to consider in inspecting after welding include size and shape of bead, appearance of bead, undercut, overlap, location of craters (indicating where operator started and stopped welding). A study of the weld and proper interpretation of these telltale signs will disclose other conditions of welding. These conditions are illustrated in Figs. 1 and 2, using a shielded arc electrode. The illustrations show the appearance of beads deposited under different procedures, some good and some poor. A study of these will indicate clearly what normal conditions are and the comparison to abnormal conditions.

The accompanying tabulation shows resultant weld characteristics obtained when proper welding procedure is used, except as indicated. This tabulation applies only to the welding of mild rolled steel in flat position with heavily coated shielded arc electrodes.

Improvements in Use of Tin

ACCORDING to the Tin Research Institute its activities during 1940 was directed largely to adapting tin to war industries, but progress in the metal's more normal applications was well maintained. A notable development mentioned in the annual report, which has just been issued, is a means of preventing the blackening of the insides of meat cans. The tinplate is put into a boiling chemical solution which rapidly produces a film of oxide on its surface; this oxide is so thin that it does not visibly alter the bright tin surface but it effectually resists blackening.

A recent discovery of the Institute is the so-called "speculum" plating, a brilliant silvery plating obtained by the electrodeposition of a tin-copper alloy containing about 45 per cent of tin; it is not quite so tarnish-resisting as chromium but it is more easily repolished. The commercial development of this plating process has been hindered by the war but two plants have been installed in England and others are being discussed.

Researches in 1940 showed that difficulties met with in soldering electro-tinned surfaces are due to the coating being too thin. The troubles disappear if the coatings are reasonably thick, and it is quite easy to make them so by using one or other of the modern electro-tinning baths. Tin coatings are now being applied electrolytically to engine pistons and rings because they greatly reduce the wear during running-in and assist in retaining the lubricating film.

The anti-friction qualities of tin are best known in connection with the bearing metals consisting mainly of tin with some antimony and small amounts of other metals. Work in the Institute laboratories has greatly enlarged the range of bearing metals available, but it remains to carry out engine tests to decide which shall be used in particular cases. The factors affecting adhesion of these bearings to the steel or bronze backing shells are being studied and are now better understood. Efforts to find a better under-water bearing for ships have led to the discovery of an alloy of outstanding superiority, having a higher percentage of tin than now used.

1500 TOOL STEELS

THIS is a continuation from last week of the indexing of approximately 1500 tool, metal cutting and die steels, and sintered carbides. In some instances the same steel is shown under several variations of the same name, in conformity with shop practice; the same steel is on occasion listed under a manufacturer's name and under a distributer's name; occasionally steels no longer made are indexed for the sake of full coverage; and, of course, some imported steels indexed are for the time being unobtainable. Thus, this indexing of all known tool steels should have maximum application in enabling users to locate and ascertain the properties of any steel produced in this country. This indexing of steels will be continued in successive issues of THE IRON AGE until completed.

S

Special Vanadium
Water hardening steel, for general work. Contains C 0.95 to 1.10, Mn 0.20 to 0.40, V 0.15 to 0.25, Si 0.15 to 0.25. Craine-Schrage Steel Co., Detroit.

Special Vanadium
A special alloy steel. Halcomb Steel Co., Syracuse, N. Y.

Special Vanadium
Water hardening steel, for punchers and heading dies. Contains C 1.00, Mn 0.40, V 0.25, Si 0.20. Kidd Drawn Steel Co., Aliquippa, Pa.

Special Vanadium
A. Milne & Co., New York.

SPS
A special alloy steel, containing W and Cr. Poldi Steel Works, New York.

SR4 Regular
A plain carbon steel. Poldi Steel Works, New York.

SST
A special alloy steel, containing W. Poldi Steel Works, New York.

Stag
A plain carbon steel. Edgar Allen & Co., Ltd., Montreal; New York.

Staminal
Oil or air hardening steel, for chisels, cold cutters, die blocks, die sinking hobs, punches, rim rolls, shear blades. Has extreme toughness. Contains C 0.55, Cr 0.40, Ni 2.70, Mn 0.90, V 0.15, Mo 0.45, Si 1.00. Latrobe Electric Steel Co., Latrobe, Pa.

Standard
A regular carbon steel. Universal-Cyclops Steel Co., Bridgeville, Pa.

Standard
Water hardening steel for tools and dies. Contains C as ordered. Henry Disston & Sons, Inc., Philadelphia.

Standard
Water hardening, carbon tool steel, for blacksmith tools, etc., where high physical properties are not required. Is hard and tough. Available in several carbon ranges. Contains Mn 0.25, Si 0.25. Columbia Tool Steel Co., Chicago Heights, Ill.

Standard
A water-hardening steel, for tools and dies and general purposes. Contains C as desired. Hawkridge Brothers Co., Boston.

Standard
Carbon steel for general purposes, containing C 0.60-1.40, Mn 0.20-0.35, Si 0.10-0.25. Braeburn Alloy Steel Corp., Braeburn, Pa.

Standard
A plain carbon steel. Boyd-Wagner Co., Chicago.

Standard
A plain carbon steel. Braeburn Alloy Steel Corp., Braeburn, Pa.

Standard
A plain carbon steel. Halcomb Steel Co., Syracuse, N. Y.

Standard
Water hardening, carbon tool steel, for threading, stamping, blanking and engraving dies. Contains C 1.00, Mn 0.25, Si 0.25. Latrobe Electric Steel Co., Latrobe, Pa.

Standard G
A plain carbon chisel steel. D. G. Gautier & Co., New York.

Standard Vanadium
Carbon-vanadium, water hardening steel for punches and severe shock tools. Resists fatigue. Available in several carbon ranges. Contains Mn 0.25, V 0.20, Si 0.20. Columbia Tool Steel Co., Chicago Heights, Ill.

Star J Metal
A non-ferrous, red-hard cutting metal for tool bits, milling cutters, form tools, boring and reaming blades, milling cutter blades, welded tip tools, etc. Contains Cr max. 35.00, Co min. 40.00, W max. 20.00, and balance max. 9.00. Haynes Stellite Co., Kokomo, Ind.

Star-Max
Molybdenum-tungsten high speed steel. Has red-hard cutting qualities. Contains C 0.78, Cr 3.75, Mn 0.30, V 1.15, W 1.50, Mo 8.50, Si 0.20. Carpenter Steel Co., Reading, Pa.

Star-Moly
A high speed steel. Carpenter Steel Co., Reading, Pa.

Star-Zenith
An 18-4-1 high speed tool steel. Has red-hard cutting qualities. Contains C 0.72, Cr 3.75, Mn 0.25, V 1.15, W 18.25, Si 0.20. Carpenter Steel Co., Reading, Pa.

Stellite
General name given a series of cast alloys of cobalt chromium and tungsten, used as a cutting tip material. Star J-Metal is the most widely used; also known as J-Metal. Haynes Stellite Co., Kokomo, Ind.

Stentor
Oil-hardening tool steel for general tool room use. Has hardness, toughness, and is non-deforming. Contains C 0.90, Mn 1.60, Si 0.25. Carpenter Steel Co., Reading, Pa.

Sterling
Water hardening steel, for tools and dies, containing carbon as required, Cr 0.15, Mn 0.30, Si 0.25. Firth-Sterling Steel Co., McKeesport, Pa.

Sterling XX
Water hardening, center free, cold heading steel, for cold heading dies, containing carbon as required, Cr 0.12, Mn 0.30, Si 0.25. Firth-Sterling Steel Co., McKeesport, Pa.

Ster V
Water hardening steel, for taps and punches. Is a "broad hardening range" type of tool steel. Contains carbon as required, Cr 0.15, Mn 0.30, V 0.25, Mo 0.25. Firth-Sterling Steel Co., McKeesport, Pa.

S.T.M.
A molybdenum-tungsten high speed steel, containing C 0.80-1.00, Mo 5.75-9.50, W 1.00 to 1.50, Cr 3.50-3.75, V 0.75-2.00, Co 3.00-8.00. Simonds Saw & Steel Co., Lockport, N. Y.

Strauss Metal
An early tungsten carbide cutting material. No longer made. Allegheny Ludlum Steel Corp., Pittsburgh.

Super
An oil hardening steel, for lathe, planer shaper tools. Contains C 1.10, Cr 3.75, Mn 0.30, V 3.00 to 3.50, W 17.00 to 18.00, Mo 0.70 to 0.90, Si 0.35. Agawam Tool Co., West Springfield, Mass.

Superb
Chrome-vanadium tool steel, for dies, drills, punches, shear knives, spindles, etc. Contains C 0.75, Cr 1.00 Mn 0.25, V 0.20, Si 0.25. Latrobe Electric Steel Co., Latrobe, Pa.

Super (H.S.)
An 18-4-2 high speed steel. Vulcan Crucible Steel Co., Aliquippa, Pa.

Super Cesco Diamond
Oil or water hardening chisel steel, suitable for hot work, for chisels, rivet sets, mine bits, shock tools, stamps and dies. Has high tensile strength and resistance to fatigue and abrasion. Contains C 0.55, Mn 1.00, V 0.45, Mo 1.30, Si 2.00. Crucible Electric Steel Co., Homestead, Pa.

Super-Chrome Die
A special alloy steel, containing Cr. H. Boker & Co., Inc., New York.

Super Cobalt
A cobalt high speed steel. Simonds Saw & Steel Co., Lockport, N. Y.

Super Die
A high carbon, high chrome die steel. Edgar Allen Steel Co., New York.

Superdie
High carbon, high chromium steel for blanking, forming, lamination and thread rolling dies, burnishing tools, plug gages. Is strong and tough, nondeforming and has high resistance to abrasion. Contains C 2.20, Cr 10.50, Mn 0.30, W 1.00, Si 1.00. Columbia Tool Steel Co., Chicago Heights, Ill.

Super Dreadnought
A high speed steel for boring tools, broaches, chasers, crowning tools, cutters, dies for forming glass, drills, file cutting chisels, gear cutters, hacksaw blades, hobs, etc. Contains Cr 4.00, V 2.00, W 14.00. Crucible Steel Co. of America, New York; also, Hawkridge Brothers Co., Boston.

Superior
A water hardening steel, containing C as specified, Mn 0.25, V 0.20, Si 0.20, P max. 0.020, S max. 0.020. Bethlehem Steel Co., Bethlehem, Pa.

Superior
Extra water hardening tool steel, for chisels, dies, cutters, punches. Contains C 0.90 to 1.00, Mn max. 0.30, Si 0.20 to 0.35. McInnes Steel Co., Corry, Pa.

Superior Ark-High Speed
An oil hardening, red hard and tough steel, for boring tools, lathe and forming tools, threading dies, gear cutters, etc., containing C 0.70-0.75, W 18.00, Cr 4.00, V 1.00. William Jessop & Sons, Inc., New York.

Superior Hollow Drill
A fatigue resistant drill steel, for mining drills, containing C 0.80, Mn 0.25, Si 0.15. Bethlehem Steel Co., Bethlehem, Pa.

Superior Oil Hardening
An oil hardening, wear resisting and tough steel, for dies, gages, hobs, press tools, taps, trimming and forming dies, broaches, etc., containing C 0.82-0.88, Mn 1.20-1.40, W 0.50. William Jessop & Sons, Inc., New York.

Superior 1
A cold work steel, for blanking and forming dies, shear knives, containing C 2.05-2.20, Cr 11.50-13.50, Mn 0.40-0.60, V 0.55-0.65, Si 0.20-0.40. Braeburn Alloy Steel Corp., Braeburn, Pa.

Superior 3
A cold work steel, for blanking and forming dies, shear knives, containing C 1.40-1.60, Cr 11.00-13.00, Mn 0.20-0.40, V 0.75-1.00, Si 0.20-0.40. Braeburn Alloy Steel Corp., Braeburn, Pa.

Super Mo-Chip High Speed
Super high speed steel, for difficult machining operations, containing carbon as required, Cr 4.00, Co 8.00, V 1.50, Mo 8.00. Firth - Sterling Steel Co., McKeesport, Pa.

Super Motung
High speed steel, for cutting tools. Has resistance to abrasion and heat. Contains C 0.80, Cr 3.75, Mn 0.25, Co 5.00, V 1.25, W 1.50, Mo 8.50, Si 0.30. Universal-Cyclops Steel Co., Bridgeville, Pa.

Super Panther
Heavy duty cobalt high speed, air or oil hardening steel for heavy cuts on cast iron or steel, stainless, or heat treated alloy steel. Develops maximum red hardness but does not resist shock as well as 18-4-1. Contains C 0.80, Cr 4.50, Co 7.25, V 2.00, W 19.00, Mo 1.00. Allegheny Ludlum Steel Corp., Watervliet, N. Y.; also Edgcomb Steel Co., Philadelphia.

Super Rapid Extra
A high speed steel, containing W. Houghton & Richards, Inc., Boston.

Super Star Zenith
An 18-4-2 high speed steel. Carpenter Steel Co., Reading, Pa.

Supersteel
A plain carbon steel. Universal-Cyclops Steel Co., Bridgeville, Pa.

Super Steel
A high speed steel. Vulcan Crucible Steel Co., Aliquippa, Pa.

Super-Van Dreadnought
An 18-4-2-1 high speed steel, for cutting annealed and medium hard materials at fast speeds; blanking dies and tools. Contains C 0.80, Cr 4.25, V 2.10, W 18.50, Mo 0.75. Hawkridge Brothers Co., Boston; also Halcomb Steel Co., Syracuse, N. Y.

Supreme
Chrome-vanadium tool steel, for chisels, pneumatic tools, punches, rivet sets, shear knives, etc. Contains C 0.60, Cr 1.00, Mn 0.80, V 0.20, Si 0.25. Latrobe Electric Steel Co., Latrobe, Pa.

Supremus
A high speed steel, recommended where exceptionally severe service conditions are to be met. Contains C 0.73, Cr 4.00, Mn 0.25, V 1.15, W 17.50, Si 0.25. Jessop Steel Co., Washington, Pa.; also Edgar T. Ward's Sons Co., Pittsburgh.

Supremus Extra
A high speed steel, recommended for tools which must give a fine smooth cut. Contains C 0.80, Cr 4.25, Mn 0.30, V 2.10, W 18.50, Mo 0.65, Si 0.30. Jessop Steel Co., Washington, Pa.; also Edgar T. Ward's Sons Co., Pittsburgh.

Swed-Oil Nonshrinking
A non-deforming steel, containing Cr and W. Kloster Steel Corp., Chicago.

T

Tack Die Steel
A special alloy steel. Crucible Steel Co. of America, New York.

T Alloy
A tungsten hot work steel, for dies and punches, containing C 0.30-0.35, Cr 3.00-3.50, Mn 0.15-0.30, V 0.30-0.50, W 10.00-11.50, Si 0.20-0.35. Braeburn Alloy Steel Corp., Braeburn, Pa.

Talide
A tungsten carbide wear resisting material for drill bushings, centerless grinder blades, lathe centers, etc. Metal Carbides Corp., Youngstown, Ohio.

Talon
A regular carbon steel. Edgar Allen Steel Co., New York.

Tantalum Carbide
See Cemented Carbide.

Tantung G
Tungsten and tantalum carbide in a matrix of cobalt and chromium, obtainable in solid tool bits or tips. Fansteel Metallurgical Corp., North Chicago, Ill.

Tapdie
Steel for taps, brass cutting, etc. Contains C 1.25, Cr 0.20, Mn 0.25, W 1.00, Si 0.25. Columbia Tool Steel Co., Chicago Heights, Ill.

Tatmo
A molybdenum-tungsten high speed steel, containing C 0.80-1.00, Mo 5.75-9.50, W 1.00 to 1.50, Cr 3.50-3.75, V 0.75-2.00, Co 3.00-8.00. Latrobe Electric Steel Co., Latrobe, Pa.

Teco
A tungsten carbide cutting alloy, made by Tungsten Electric Corp., Union City, N. J.

Teemax
See Teenax.

Teenax
A non-deforming steel. Simonds Saw & Steel Co., Lockport, N. Y.

Teenax N
A special alloy steel, containing W and Cr. Poldi Steel Works, New York.

Teenax NB
A special alloy steel, containing W. and Cr. Poldi Steel Works, New York.

Tennessee Special
See references to Drill Steel, Tool Steel, and Channeller Steel. Made by Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

Teton
Carbon-chrome, oil or water hardening steel, for ball bearings and machine parts subject to wear. Hardens rather deep. Contains C 1.00, Cr 1.30, Mn 0.30. Allegheny Ludlum Steel Corp., Watervliet, N. Y.; also Edgcomb Steel Co., Philadelphia.

Thermo
A special alloy steel. Halcomb Steel Co., Syracuse, N. Y.

Thermo Die
Alloy tool steel, for aluminum and zinc die casting dies. Contains C 0.45, Cr 2.40, V 0.20. Crucible Steel Co. of America, New York.

Thermo Die
An oil-hardening steel, for zinc alloy die casting. Resists heat-checking well. Contains C 0.40, Ni 2.40, Mn 0.65, V 0.20, Si 0.25. Hawkridge Brothers Co., Boston.

Thermold A
Chrome hot work steel, for hot work dies, die casting type. Maximum resistance to heat checking. Contains C 0.35, Cr 5.00, Mn 0.45, V 0.45, Mo 1.00, Si 1.00. Universal-Cyclops Steel Co., Bridgeville, Pa.

Thermold B
Chrome hot work steel, for all varieties of hot work dies. Maximum resistance to heat checking. Contains C 0.35, Cr 5.00, Mn 0.30, W 1.50, Mo

1.70, Si 1.00. Universal-Cyclops Steel Co., Bridgeville, Pa.

No. 3
Metal cutting alloy no longer made. Haynes Stellite Co., Kokomo, Ind.

3-C
An air or oil hardening, non-deforming steel for special purposes where a hard steel with extreme resistance to wear is required. Contains C 2.15, Cr 12.5, Mn 0.45, Co 0.25, V 0.18, Si 0.55. Jessop Steel Co., Washington, Pa.

3-C Die
A non-deforming steel. Edgar T. Ward's Sons Co., Pittsburgh.

No. 35
A chrome hot work steel. Colonial Steel Co., Pittsburgh.

3581 Chisel
Water hardening steel, for chisels and pneumatic tools. Containing C 0.50-0.60, Mn 0.60-0.75, V 0.15-0.25, Mo 0.30-0.40, Si 1.50-1.70. Darwin & Milner, Inc., Cleveland.

Three Star
A cobalt high speed tool steel. Contains C 0.70, Cr 4.0, Co 5.5, V 1.0, W 18.0, Mo 0.55. Midvale Co., Nicetown, Philadelphia.

Tiger Brand
Steel for high speed cutting tools. Contains C 0.75, Cr 4.00, V 1.00, W 0.18. Bissett Steel Co., Cleveland.

Tiona
Air hardening die steel, for blanking dies, etc. Is tough and suitable for medium life tools and dies. Contains C 1.00, Cr 0.85, Mn 2.00, Mo 0.85, Si 0.30. Universal-Cyclops Steel Co., Bridgeville, Pa.

Titus
A special alloy steel, containing Cr and V. Universal-Cyclops Steel Co., Bridgeville, Pa.

T-K
A tungsten alloy hot work steel. Carpenter Steel Co., Reading, Pa.

T-Mo
A molybdenum high speed steel. Halcomb Steel Co., Syracuse, N. Y.

Toolholder
A special alloy steel. Midvale Co., Philadelphia.

Tool Room
An oil-hardening non-deforming die steel. Bethlehem Steel Co., Bethlehem, Pa.

Tool Steel
A water-hardening, carbon tool steel; for broaches, lathe centers, dies, thread cutting, stamping, hobs, knives for wood working, etc. Contains C 0.90-1.01, Mn about 0.50, Si 0.25, P 0.025, and S 0.030. Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

Top Notch
An oil hardening steel, for all kinds of tools which must combine keen cutting, maximum strength and hardness, extreme toughness, and resistance to abnormal shocks. Contains C 0.50, Cr 1.15, Mn 0.25, V 0.20, W 2.45, Si 0.70. Jessop Steel Co., Washington, Pa.

Torpedo
Non-deforming, oil hardening steel for dies, punches, rivet sets, shear blades, etc. Has low distortion and shrinkage, good resistance to abrasion and fatigue. Contains C 0.90, Cr 0.50, Mn 1.30, W 0.50, Si 0.35. Lehigh Steel Co., New York.

Tough M-Temper
A tough steel for shear blades, special parts, etc., containing C 0.45, Cr 0.95, Mn 0.55, Co 0.20. Bethlehem Steel Co., Bethlehem, Pa.

Triangle X Extra
A plain carbon steel. Uddeholm Co. of America, Inc., New York.

Triangle X Special
A plain carbon steel. Uddeholm Co. of America, Inc., New York.

Trimo
Air hardening non-deforming steel, has maximum resistance to abrasion, containing C 1.50, Cr 12.00, Mn 0.30, V min. 0.20, Mo 0.80, Si 0.30. Uddeholm Co. of America, Inc., New York.

Tri-Mo
A special alloy steel, containing Cr and V. Peninsular Steel Co., Detroit.

Tri-Mo Air Hardening
A special alloy steel. Adams & Osgood Steel Co., Boston.

Triple Alloy Punch
A special alloy steel. Crucible Steel Co. of America, New York.

Triple Die
Oil hardening steel, for high production trimming and shaping dies. Is non-distorting and has high wear resistance. Contains C 2.25, Cr 12.50, V 0.25. Firth-Sterling Steel Co., McKeesport, Pa.

Triple Express
High speed steel, containing C 5.00, Cr 5.00, V 1.00, W 17.00, Si 0.8. Hidalgo Steel Co., New York.

Triple Life D-C
Water or oil-hardening steel, for dies, reamers, etc., containing C 1.20, Cr 4.00, Mn 0.30, Si 0.20. Darwin & Milner, Inc., Cleveland.

Triton
Chisel steel, containing C 0.50-0.55, Cr 0.15-0.25, Mn 0.25-0.35, Mo 0.50-0.70, Si 0.90-1.10. Braeburn Alloy Steel Corp., Braeburn, Pa.

Tri Van
A special alloy steel. Adams & Osgood Steel Co., Boston.

Trojan
A high speed steel, containing W, Cr, Mo and Va. Canadian Atlas Steels, Ltd., Welland, Ont., Canada.

Trojan No. 8
A 0.75-0.85 carbon water-hardening steel; hardens, welds and forges readily; is strong and tough. Used for pick points, hand chisels, blacksmith, mine and quarry tools, pneumatic street tools, etc. Horace T. Potts Co., Philadelphia.

Trojan No. 9½
A 0.90-1.00 carbon water hardening steel; hardens, welds and forges readily; is strong and tough. For brake and forming dies, etc. Horace T. Potts Co., Philadelphia.

Truform
An oil hardening, non-deforming steel, for tools that must possess extreme accuracy combined with keen cutting edge. Contains C 0.90, Cr 0.50, Mn 1.20, W 0.50, Si 0.30. Jessop Steel Co., Washington, Pa.; also Edgar T. Ward's Sons Co., Pittsburgh.

Truform Special
A non-deforming steel. Edgar T. Ward's Sons Co., Pittsburgh.

T. T. Q.—High Speed
An oil hardening, red hard and tough steel, for cutting extremely hard metals and abrasive materials, containing C 0.70-0.75, W 22.00, Cr 5.00, Co 11.00, V 1.60. William Jessop & Sons, Inc., New York.

Tuncro
Oil hardening steel, for hot working dies subjected to severe shock and heavy duty, for chisels, punches, pneumatic tools. Contains C 0.50, Cr 1.40, Mn 0.25, V 0.25, W 2.00, Si 0.25. Atlantic Steel Co., New York.

Tungo
A special alloy steel, containing W. Colonial Steel Co., Pittsburgh.

Tungsten Carbide
See Cemented Carbide.

Tungsten Hack Saw
Hack saw steel, containing C 1.20, V 0.10, W 1.00. Henry Disston & Sons, Inc., Philadelphia.

Tungsten Hot Work
A hot work steel, for hot shearing, hot punching, extrusion dies, hot drawing dies and various other hot work operations. Contains C 0.40 to 0.45, Cr 2.50, V 0.10 to 0.15, W 8.00 to 10.00. A. Milne & Co., New York.

Tungsten Tap
A special alloy steel, containing W. K. Engelsted, New York.

Twinvan
A general purpose, high speed steel, containing C 0.78-0.84, Cr 4.00-4.50, Mn 0.25-0.35, V 2.00-2.25, W 18.00-19.00, Mo 0.50-0.80, Si 0.20-0.50. Braeburn Alloy Steel Corp., Braeburn, Pa.

2 B (HC)
A hot work steel, recommended for piercing punches, mandrels, gripper, heading and extrusion dies and rolls for rolling hoes and spades. Contains C 0.48, Cr 2.75, Mn 0.28, V 0.30, W 11.25, Si 0.30. Jessop Steel Co., Washington, Pa.; also Edgar T. Ward's Sons Co., Pittsburgh.

2 B (LC)
A hot work steel, for forming dies of various kinds. Contains C 0.30, Cr 3.15, Mn 0.25, V 0.30, W 10.00, Si 0.25. Jessop Steel Co., Washington, Pa.

2 B (MC)
A hot work steel, adaptable for tools subject to heavy battering action where hardness and considerable toughness are required. Contains C 0.35, Cr 3.00, Mn 0.25, V 0.30, W 13.5, Si 0.30. Jessop Steel Co., Washington, Pa.

(To Be Continued Next Week)

Electroplaters Debate Year's Developments

Ellsworth T. Candee, new president of the American Electroplaters' Society.

WHAT metal substitutions can be made in this critical period is a particularly timely subject. This, and recent developments in electropolishing, electroplating, removal of impurities from electrolytes, were described at the annual convention of electroplaters, and are reported herein.

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THE 29th annual convention of the American Electroplaters' Society, held in Boston, June 9 to 12, had an attendance of 720 which broke all records. The program was varied and interesting; the sessions were thronged and the discussions warm. A feature of the convention was the day set aside for visits to the handbag manufacturing plant of Whiting & Davis Co., Plainville, Mass., and the electric clock factory of Warren Telechron Co., Ashland, Mass.

Attracting considerable attention was an unscheduled paper delivered by Dr. William Blum, National Bureau of Standards, Washington. Mr. Blum dealt with "Metals for the Electroplating Industry," as a companion to an earlier talk by Dr. Stratton of the O.P.M. on the present metal shortage. It covered the question, "What can the plating industry do in this emergency?" It was pointed out that in general there are two courses open to the operator of a plating plant: (1) To get defense contracts; (2) to find substitute materials for those in which shortages exist.

Defense contracts may include a considerable amount of the usual equipment for living which must be provided for the Army and Navy, housing for defense workers, etc., all of which require plated products in the normal course of operations.

The shortage of aluminum, brass, stainless steel, etc., may drive industry into plated materials as a method of saving strategic metals. Substitutes for nickel are difficult to find. Thinner coats can be applied with the difference made up by heavier coats of copper. For thick coats, the copper should be buffed and an equal amount of copper used to make up for the reduction of nickel. For thin coats, the copper should also be buffed and more copper added than the reduction in nickel. Under any circumstances, the minimum nickel coating to prevent copper tarnish is 0.0001 to 0.0002 in.

It may be possible for purely protective purposes to use a lead plate from the fluoborate solution. It is also possible to use nickel salts to feed metal into the bath if insoluble anodes are used.

Excessive use of nickel may be avoided by better distribution of current by shielding and insoluble anodes. It may be possible to use citrates instead of tartrates in copper solutions.

It is vital to recover the usable drag-out to prevent excessive losses of materials.

It is not practical to use chromium directly over copper because of the marked tendency towards

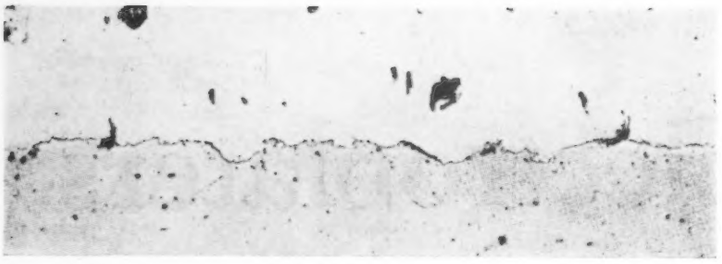

FIG. 1—Photomicrographic cross-section perpendicular to the direction of polishing. Steel specimen polished with wheel headed with 120 grain. Magnification 500 diameters.

corrosion and flaking, as chromium will accelerate the corrosion of the copper. Chromium may be deposited directly on brass in moderate thicknesses.

Chromium plated directly on steel must be at least 0.001 in. thick to prevent porosity and quick corrosion. For general decorative work this is not practical.

Silver and gold may be used, but the total quantities available, at least, of gold, will not be sufficient to cover the areas formerly coated by nickel.

It was Dr. Blum's belief that the electroplating industry would meet its present difficulties and improve its processes, and that the improvements would continue in operation after the emergency was over.

Polishing Prior to Plating

Gerald A. Lux, Research Associate of the American Electroplaters' Society at the National Bureau of Standards, Washington, read a paper on the "Polishing of Steel Specimens Prior to Plating for Exposure Tests." The American Electroplaters' Society and the National Bureau of Standards are cooperating in an investigation of the effects upon the protective value of plated coatings caused by variations in the method of polishing the base metals. Cold rolled steel, rolled and cast brass and zinc-base die castings will be used. These will be polished under controlled conditions, plated with specified thicknesses of nickel (including bright nickel) and chromium, and exposed outdoors in three locations.

The following tentative conclusions may be drawn regarding metal polishing under the conditions of the work as carried on to date.

(1) The amount of metal removed in a single pass is relatively small, and usually corresponds to an average reduction in thickness of 0.0001 to 0.0005 in., according to the grain size and the wheel pressure. (See Fig. 1.)

(2) Successive passes on the same steel strip during the useful life of a wheel head (for this study) having relatively fine grain (220) and used with low pressure, (18 lb.) remove a fairly constant weight of metal, but the Profilometer readings gradually decrease. This decrease, observed during the life of all wheel heads used, is probably the result of the breaking down of the individual grains.

(3 The amount of metal removed per pass increases with the pressure. A certain minimum pressure (in this case about 35 lb.) was necessary to polish the entire surface. If the pressure is too high, the steel may be "burnt" (oxidized).

(4) With continued use and repeated heading, a polishing wheel becomes more flexible, and less pressure is required to produce polishing of the entire surface.

(5) With a given grain size and with given operating conditions, there is an optimum pressure with respect to (a) completeness of polishing, (b) absence of burning, (c) weight of metal removed, and (d) effective life of wheel head. The actual pressure is usually a compromise of these values.

(6) The polishing pressure has no significant effect on the scratch depth.

(7) Continued use of a wheel head in preparation of specimens was marked by a greater rate of decrease in Profilometer values than in weight of metal removed. In general, the end of the effective life of a wheel head was caused by a sharp decrease in Profilometer values rather than by a decrease in metal removed.

(8) The effective life of a head with a given grain size is not greatly affected by the finish of the steel prior to polishing with that head (see Fig. 2).

(9) Polishing with a given grain size removes about the same amount of metal per pass and yields about the same Profilometer values, regardless of the finish prior to that polishing. The average thickness of metal removed per pass was considerably more than the approximate depth of scratch with the previous coarser polish (about four times the r.m.s. Profilometer reading). In principle, nearly this amount of metal must be removed to obliterate previous scratches.

(10) The shorter life of heads with finer grains may be partly caused by the smaller weight of grain on their surfaces.

(11) The application of oil to polishing wheel heads of a given

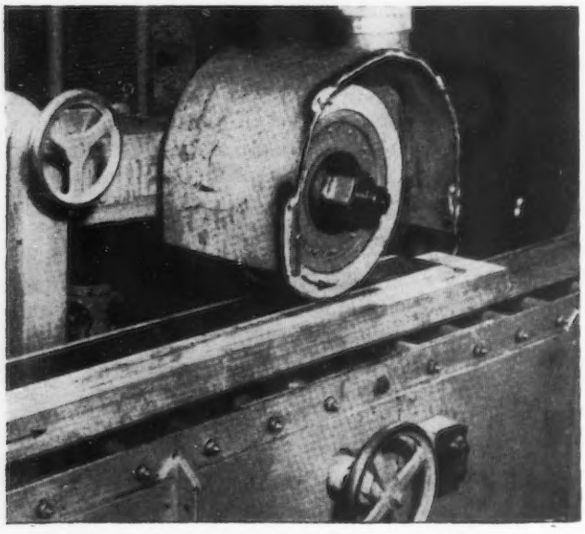

FIG. 2 — Automatic metal polishing machine.

grain size materially reduces both the amount of metal removed and the Profilometer readings. With oiled wheels, a higher polishing pressure is required to remove enough metal to eliminate scratches from preceding finishes.

Electropolishing Stainless Steel

One of the most important papers of the convention was "Electropolishing Stainless Steel in Phosphoric-Sulphuric Acid Baths" by Charles L. Faust and H. A. Pray, Battelle Memorial Institute, Columbus. It described commercially operable methods, which relate primarily to the 18 Cr-8 Ni type of stainless seteel, but are also applicable to most of the commercial iron-nickel-chromium alloys.

The electropolishing baths are composed of sulphuric, phosphoric and chromic acids. All are commercial materials, produce no corrosive fumes and are easily handled. These baths are termed the "sulphuric-phosphoric type." Although chromic acid improves the electropolishing ability, the sulphuric and phosphoric acid concentrations have broader influence on the overall results.

Stainless steel can be electropolished in baths covering a rather wide range of concentrations and ratios of H_2SO_4 and H_3PO_4. In general, the baths contain 50 per cent or more of total acid concentration with 5 to 85 per cent of H_2SO_4, 5 to 85 per cent of H_3PO_4, and up to 20 per cent of CrO_3. The CrO_3 content does not influence greatly the optimum H_2SO_4/H_3PO_4 ratio of the baths.

An important variable in the bath is the water concentration, which can vary only throughout a relatively narrow range. The water tolerance is wide enough to be well within the range of commercial control. In the range of 13 to 22 per cent water, acceptable results are obtained at 50 to 500 amp. per sq. ft. Higher water content increases the minimum current density required.

Operating characteristics of the baths are set by the H_2SO_4/H_3PO_4 ratio as well as the total acidity. More uniform brilliance and color are secured by electropolishing in baths having the smaller H_2SO_4/H_3PO_4 ratios. These baths have lower minimum operating current density, wider current density range and lower tank voltages. In all cases an increase in water content over the specified value usually required higher current density, or a lower temperature or both.

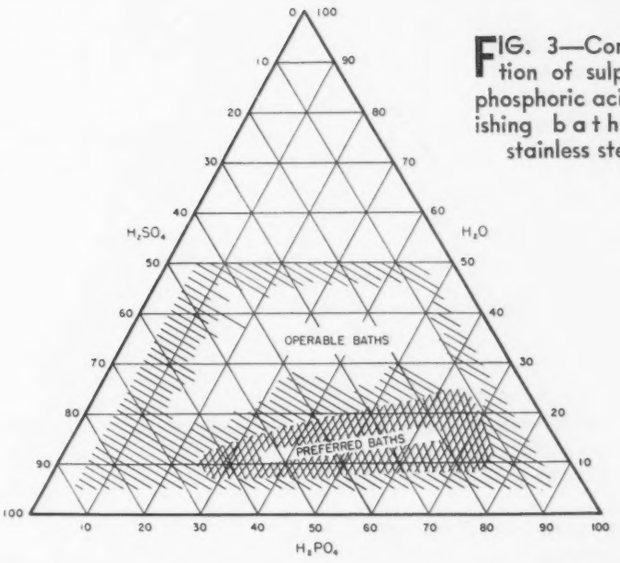

FIG. 3—Composition of sulphuric-phosphoric acid polishing baths for stainless steel.

The data show that: (1) phosphoric acid lowers the operating current density and tank voltage; (2) sulphuric acid extends the current density range; and (3) the baths having 15 to 40 per cent H_2SO_4 and 67 to 44 per cent H_3PO_4 have wider range of operable current density. The anode current efficiency gives no direct indication of electropolishing ability of a given bath. (See Fig. 3).

These observations are in line with the general trend that an increase in H_2SO_4/H_3PO_4 ratio in the bath causes an increase in tank voltage.

The electropolishing results in sulphuric-phosphoric baths are improved by the presence of chromic acid in amounts as small as 0.1 per cent by weight. In the case of some alloy compositions, chromic acid is beneficial in considerably larger concentration. Up to 10 per cent or more of CrO_3 is soluble in these baths.

All variables that control the electropolishing are interdependent so that no simple, specific discussion of each variable can be attempted. An account of the interrelationship of the variables, a change in one operating condition can, without limits, be offset by producing a compensating change in one or more of the other factors.

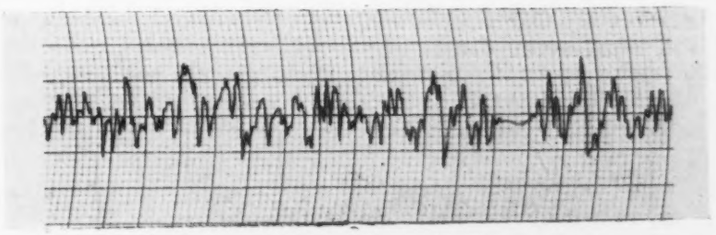

FIG. 4—Surface analysis chart of roughness remaining after wheel polishing with 120, 150, and 200 grit dry. Magnification horizontally 17 diameters, vertically 4000 diameters.

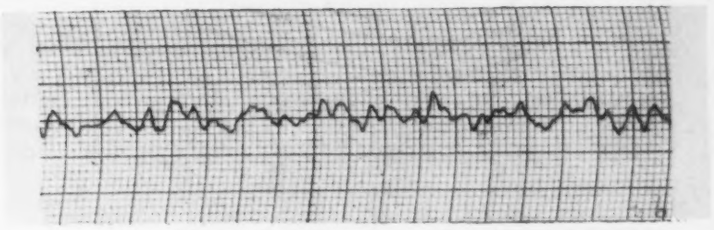

FIG. 5—Same surface as shown in Fig. 4, but after electropolishing with removal of 0.0005 in. of metal.

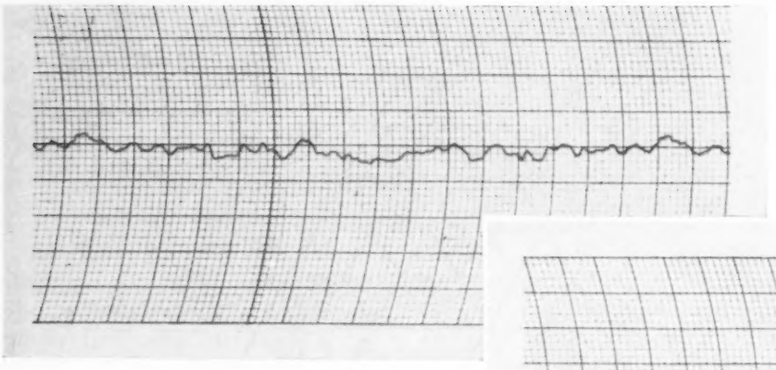

FIG. 6—Same surface as shown in Fig. 4, except electropolished longer than for Fig. 7 and removing about 0.001 in. of metal. (Left.)

FIG. 7—Same surface finish as that in Fig. 4 after mechanically buffing in a production schedule.

Although the limits of variation in each factor are well within the realm of commercial control, there are definite ranges which must be recognized.

Thus, a decrease in current density, an increase in temperature, or an increase in water content decreases polarization. Therefore, such variation in those three factors similarly affects the appearance obtained by electropolishing.

Excellent results are obtained at 50 to 2000 amp. per sq. ft. and even higher. However, one naturally prefers to select the current density within a practical range. The minimum practical current density for electropolishing formed articles in the 15 to 20 per cent H_2SO_4—63 to 67 per cent H_3PO_4 bath is about 70 to 125 amp. per sq. ft.; in the 40 per cent H_2SO_4—44 to 48 per cent H_3PO_4 bath, about 150 to 250 amp. per sq. ft.; and in the 60 per cent H_2SO_4—28 per cent H_3PO_4 bath, about 250 to 500 amp. per sq. ft. These ranges in minimum current density exist because of the effect of alloy composition and bath temperature. Limitations in generator capacity, racking, tank voltage and tank cooling define the maximum current density limits.

In the 15 to 20 per cent H_2SO_4—63 to 67 per cent H_3PO_4 type of bath, 18 Cr-8 Ni stainless steel is electropolished at current densities of 100 to 500 amp. per sq. ft. at 115 to 150 deg. F. The same bath may be used to electropolish 18 per cent Cr and 29 Cr-9 Ni stainless steels at 65 to 200 amp. per sq. ft. at 170 to 190 deg. F. When operated at 195 to 285 deg. F. the 15 to 20 per cent H_2SO_4—63 to 67 per cent H_3PO_4 bath will electropolish the 12 to 13 per cent Cr alloy that is used for cutlery stainless steel, requiring 125 to 250 amp. per sq. ft. The 13 and 18 per cent Cr types of stainless steel are also electropolished by treatment at 150 to 250 amp. per sq. ft. in the 40 H_2SO_4—48 per cent H_3PO_4 bath at 170 to 195 deg. F.

In general, the alloys of higher Cr/Ni ratio require electropolishing at lower current densities and higher temperatures. The alloys of lower Cr/Ni ratio require higher current densities and lower temperatures.

Owing to its effect on anodic activity in the polishing bath, the temperature is an important variable. The operable temperature range for each current density and bath is quite wide enough for commercial control, generally being within 10 to 20 deg. F of the specified value. Actual operating temperatures are within range of 80 to 300 deg. F. and generally from 110 to 200 deg. F. A large increase in temperature increases the anodic activity (decreases polarization and increases diffusion rate). Therefore, higher current density is then required to maintain the "pseudo-passive" state necessary for electropolishing.

Too high temperature causes the electropolished surface to be: "pebbly" although very lustrous; dull; pitted; or even "etched" in extreme cases. These same symptoms can also partially result from too high water content in which case lower temperature is required.

The most advantageous commercial use of electropolishing is in the finishing of formed, stamped or cast objects. One of the outstanding properties of the sulfuric-phosphoric baths is their excellent throwing power which results in uniformity of color and brilliance of finish. Good throwing power in electropolishing is identified with uniform thickness of metal removed. Consequently, uniformly brilliant finish is produced on ar-

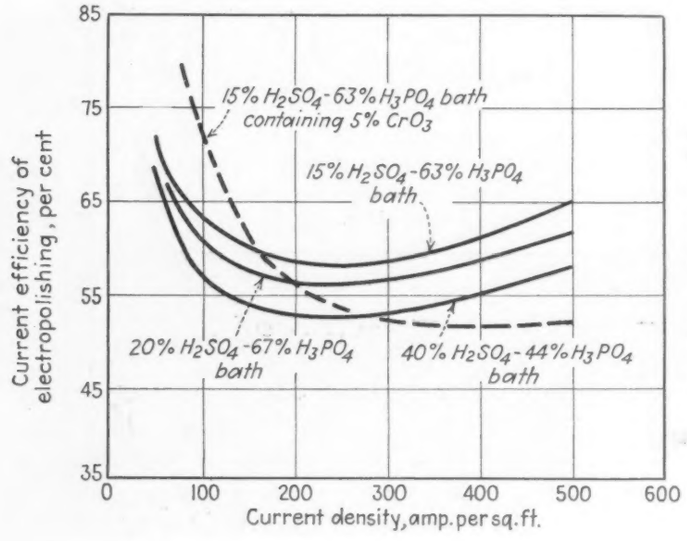

FIG. 8 — Current efficiency of electropolishing 18-8 Cr-Ni stainless steel in several baths. Temperature 110 deg. F.

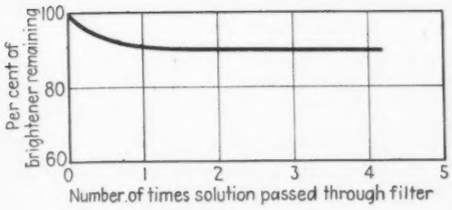

FIG. 10—Effect of continuous filtration on an organic brightener.

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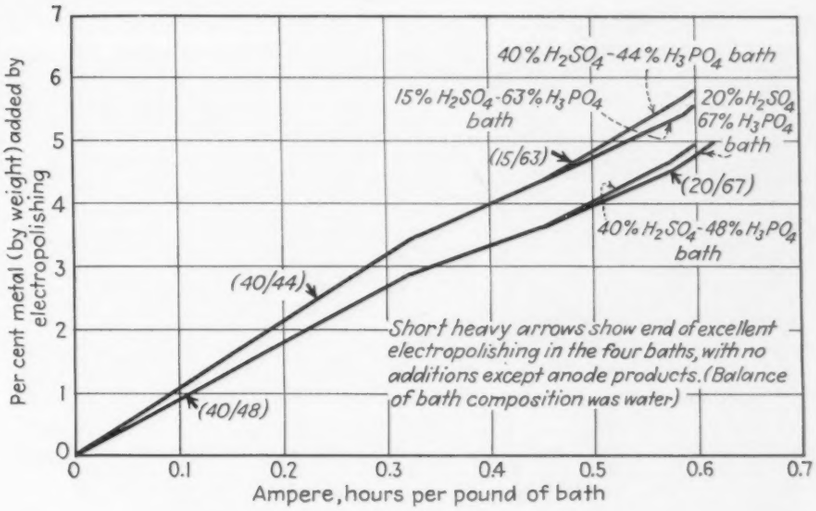


FIG. 9—Increase in metal content of various sulphuric-phosphoric baths during electropolishing 18-8 Cr-Ni stainless steel. Per cent metal based on initial bath weight.

ticles that are very difficult, if not impractical to buff mechanically.

Tank voltages for electropolishing in the sulphuric-phosphoric acid baths are within the limits of commercial operation with 12 volt generators of the type used in electroplating. The H_2SO_4/H_3PO_4 ratio and concentration have an effect on tank voltage.

Electropolishing is readily accomplished in a still bath, but a certain amount of controlled agitation gives improved results. Gas discharge during still electropolishing "scours" a furrow through the "polishing film." Because of the local "film thinning" effect, there is greater efficiency of anodic dissolution in these "gas track regions." Therefore, the surface becomes irregular. Ridges begin at points of gas discharge such as holes, peaks, edges, etc. Ridging effects are particularly noticeable in aged baths. (See Figs. 4 and 5).

Mild agitation is beneficial for three reasons: first, it changes the gas flow from a continuous straight line to an eccentric path. Consequently, there is no pronounced local "furrowing" of the film to cause a ridged, but otherwise polished surface.

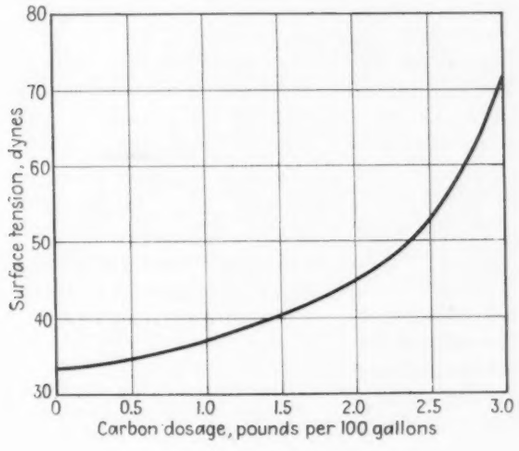
The second effect of mild agitation is to improve the uniformity of thickness of the electropolishing film. The processing time is shortened and the uniformity of luster is improved.

Thirdly, mild agitation increases the temperature uniformity throughout the tank. (See Figs. 6 and 7.)

The time for finishing a given type of work depends on: (1) the result desired; (2) initial surface; (3) current density; (4) temperature; (5) bath composition; and (6) degree of agitation. Economical electropolishing times are in the range of from 1 to 15 min. The upper limit of time is controlled solely by the limiting metal thickness loss and costs. (See Fig. 8.)

The economic life of the bath is an important factor in commercial electropolishing. Extensive studies have demonstrated that the useful life depends on: (1) the concentration of dissolved metals; (2) the state of oxidation of dissolved metals; and (3) the sulphuric-phosphoric ratio of the bath. A certain amount of dissolved metal, depending on the H_2SO_4/H_3PO_4 ratio can be tolerated without affecting the results.

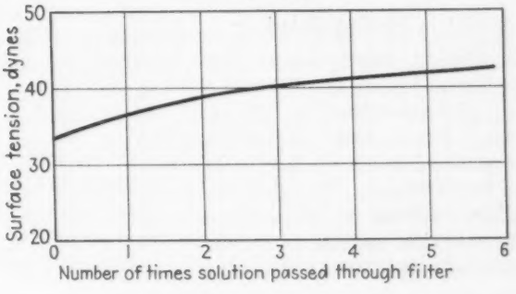
Metal removal is accomplished by precipitation as sulphates and by bath drag-out. Iron and nickel sulphates are not soluble in the simple sulphuric-phosphoric acid baths to an extent that is harmful to the electropolishing results. When chromic acid is present in the bath, iron and nickel sulphates are not so readily precipitated. However, chromic acid improves the uniformity of brilliance and color on shaped objects of some of the stainless alloys.



BELOW

FIG. 11—Effect of carbon dosage on surface tension. Original concentration of wetting agent 0.05 per cent.

FIG. 12—Continuous filtration with insufficient wetting agent.



As the concentration of dissolved metals increases in the baths the anodic activity decreases somewhat. (See Fig. 9.)

Chemical control consists of analyzing the baths for —SO_4 —PO_4, total metals, Cr, Ni, Fe, and determining water concentration as an empirical value based on the analysis, density and viscosity of the bath. The analytical procedures consist of routine methods that are easily carried out. The bath composition can vary over wide enough limits, so that analysis is not required at unreasonable frequency.

All concentrations of acids encountered in the electropolishing baths and in rinse tanks, can be handled in lead-lined equipment. The electropolishing baths of 30 per cent water content or less can be handled when cool for appreciable periods in iron or cast iron equipment. Internal cooling coils and steam heating coils are made of lead. External heating or cooling can be provided by means of heat exchangers.

Cathodes consist of lead sheets or strips suspended from bus bars as in the case of anodes in plating tanks. In special cases auxiliary cathodes are used.

Impurities in Plating Solutions

W. A. Helbig, Darco Corp., New York, in his paper on the "Physical Removal of Impurities in Plating Solutions," stated that impurities can be removed from plating solutions by two methods, filtration and adsorption. Solids to be filtered from the solution consist of insoluble matter from the anodes and chemicals in the bath, abrasives, dusts, detritus, etc. The total is rarely over 1 to 2 per cent by weight of the solution, except for products of chemical precipitation.

The author recommended beginning filtration with low pressure and increasing the pressure only enough to continue the flow at an even rate, thus preventing early clogging and later forcing of solids through the filter.

For fluffy solids, diatomacious filter aids are recommended. The solids capacity of a filter determines the length of time between filter cleanings which are facilitated by removable pads or papers. A filtration rate of about 25 to 50 gal. per hr. per sq. ft. of effective filter area is considered good practice. Acid solutions generally filter a little faster than alkaline. Another basis of calculations is to figure about two hrs. for filtering one 500-gal. tank load.

The author discussed the use of activated carbon to remove organic impurities and the calculations for the quantities to be used. He explained filter operation, re-circulation, pre-coating with a diatomacious filter aid, measuring filtration rate, regulation of pressure and flow rate, pumps and valves, handling filter discharge and temporary filter shut-downs during continuous filtration. (See Fig. 10.)

Inorganic impurities which are colloidally dispersed, (as may be the case with many metal hydroxides and sulphides, and some carbonates, sulphates, or ferri and ferrocyanides) and also a great variety of organic impurities, are amenable to removal by the physical process of adsorption on activated carbon.

Adsorption is a process whereby impurities of this kind are removed from liquids by transferring them to a retentive, "activated" surface, such as is provided by activated carbon.

The transfer is not reversible—once impurities are trapped on the activated carbon surface, they are not released when the carbon is washed with water or with "pure" plating solution. The transfer is, theoretically, never complete. A balance or equilibrium is reached between the amount of impurity on the carbon surface, and the amount remaining in solution.

The transfer is selective, in the sense that if several impurities are present simultaneously, more of one is adsorbed than of another. (See Fig. 11.)

One type of carbon will be suitable for the adsorption of colloids and complex organic substances; another, for the treatment of non-aqueous liquids; and a third, for removing substances causing taste and odor in water.

Activated carbon must under no circumstances be added directly to a plating tank. A small residue of carbon will inevitably adhere to some of the surfaces of the tank no matter how carefully carbon is filtered out and no matter how carefully the tank is cleaned afterward. Activated carbon suspended in a plating solution has the same harmful effect as any other finely divided solid, causing rough work and other defects in the deposited metal.

Brighteners, as a general rule, are not strongly adsorbed: i.e., equilibrium in the transfer from solution to carbon surface is reached while there is still an appreciable quantity of brightener in solution. The smaller the carbon dosage, the larger the amount of brightener remaining unadsorbed. Wetting agents, as a class, are more strongly adsorbed. (See Figs. 12 and 13.)

Ed. Note:—This report will be concluded next week, with descriptions of plating equipment,

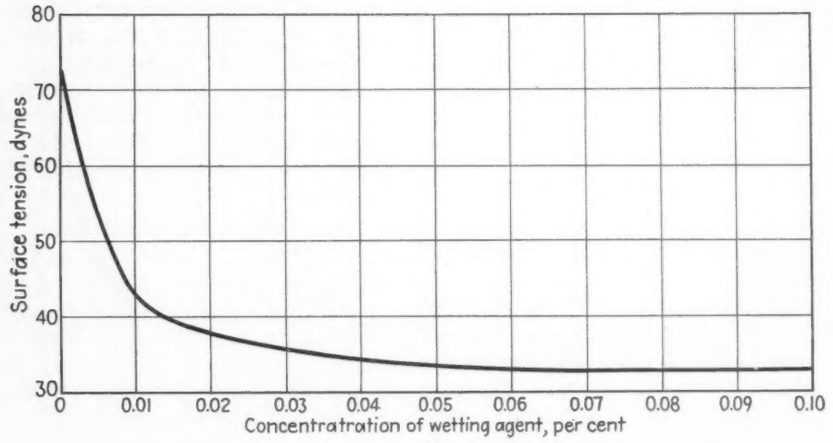


FIG. 13—Typical wetting agent curve.

(*Advertisement*)

EUGENE (JACK) PHILLIPS, 1117 Cleckler South, Fort Worth, Texas, winner of first prize of $5,000 in the Revere Award for the idea doing most to help speed America's industrial defense program. Tall and lanky, Phillips is 33 years old and employed as senior radio electrician with the C. A. A. central depot at Fort Worth. When a close friend, Captain Jerry Marshall, crashed in Arkansas in landing an airplane, Phillips immediately set to work on his prize winning idea—an improved method of blind landing. He studied nights, gave up car, vacations and other pleasures for necessary equipment. His wife predicts most of the prize money will be spent for new equipment. He has three children, Patricia, 7; Kenneth, 4; James, 8 months.

The men and management of Revere Copper and Brass Incorporated are proud that the first Award of $5,000 goes to a man like Phillips. We also wish to thank the thousands of other American workmen for their splendid loyalty and cooperation in this effort to speed up industrial defense. Revere Copper and Brass Incorporated, 230 Park Avenue, New York.

On The Assembly Line

BY W. F. SHERMAN
Detroit Editor

• Automobile-aviation industry has quietly shifted emphasis from twin-engine bombers to four-engine Flying Fortresses . . . Aviation program of the industry has been in a state of flux for some time . . . Ford rushing program on big aircraft engines.

DETROIT—A shift in emphasis from twin engine bombers to the four-engine Flying Fortress type has quietly taken place, and the Army has recast its bomber procurement program so it is difficult to make any up-to-date report on the progress of automotive firms who are acting as sub-contractors to the aviation industry.

The significance of this is that it is becoming increasingly difficult to predict the course of the automotive-aviation joint effort or to evaluate it in terms of units (airplanes or sub-assemblies) to be produced, labor and factory space to be employed, tooling requirements, etc.

The automotive-aviation program has been continuously in a state of flux since last fall. Original concepts were gaged at something like 3600 twin-engine bombers per year, these to be produced at a rate of about 100 per month, each, by Ford, General Motors and Chrysler. Almost immediately it appeared that the plan was being molded, instead, around a schedule of 1200 four-engine bombers and 2400 twin-engine bombers. In this form plans were carried along through the winter and spring months and a lot of progress was made in standardizing some of the features of design, finding parts suppliers in this area and ironing out the misinterpretations which arose between the two industries.

Although all the parties concerned failed to agree on a single type of twin-engine bomber to be manufactured in this program, the plans had just about "jelled" when they were upset by the switch to more four-engine bombers and many less twin-engine bombers.

Production Schedules Upset

Meanwhile, these efforts were being paralleled by a series of private contracts between Douglas and Murray, Briggs, Fisher Body and other potential suppliers. Because negotiations between Douglas and these firms were undertaken privately about the middle of last year, work had progressed to a very advanced stage before the upset came. Briggs, with the advantage of a start last spring on Vought-Sikorsky wing production, has been making Douglas wing flaps and small parts for several months. Murray already is in production on similar parts, was scheduled to produce its first inner wing panels within a few weeks and should have accelerated its aviation program at a speedy clip this summer and fall. Fisher has already provided a lot of tools and equipment, as scheduled in its part of the contract.

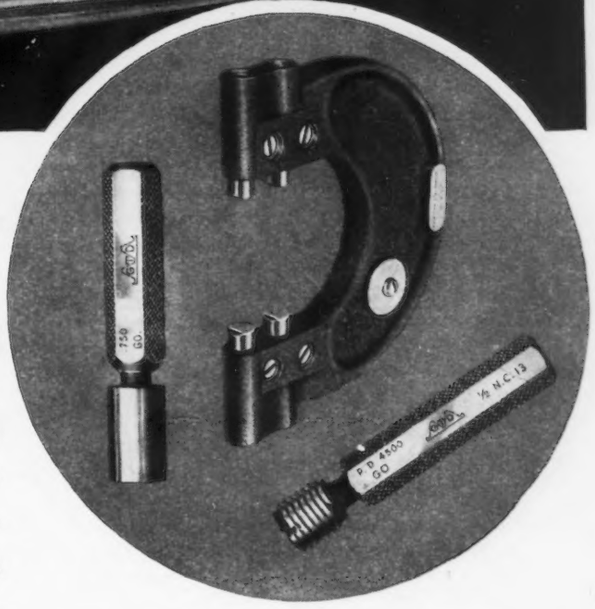
These accomplishments, however, may go almost unheralded because caprice, or necessity, has so importantly upset production schedules. The twin-engine work contracted for in Detroit is being slashed in half and other work on the four-engine planes is going to be substituted for it. Perhaps in the immediate future this new work may prove to be more demanding of automotive facilities than the cancelled contracts would have been; one authority in the industry looks for at least a 25 per cent increase in man hours of labor required in the immediate future. More floor space also is being scheduled, although at the moment the exact parts which will be built in the four-engine program are not known. (This, of course, does not refer to the Ford contract on the Consolidated four-engine bomber which will include sub-assemblies and complete planes ready to fly away; it refers only to the private contracts placed with body builders.)

Although the substitution of four-engine bomber work for the twin-engine work has not entirely disrupted the program locally, it will have effects comparable to a major model changeover after only a few months' work on the "old model." The change in plans came in time so some of the body builders were able to cut short their extensive plans for tooling on the twin-engine planes. Instead of requiring all of the jigs and fixtures which were originally laid out, they will get by with half as many, and sometimes fewer. Also, their production of twin-engine parts will be completed in a shorter period and will cut off more sharply, with the production of four-engine parts expected to start then. Output on the parts for the four-engine planes can hardly be expected to start before the first of next year. Life of the new contracts is reported to be indefinite.

Bomber Parts Being Allocated

An entirely new allocation of parts is being made because the units originally scheduled (on the twin-engine plane) will be so much bigger (for four-engine planes) that they cannot be shipped by rail. Breaking down the four-engine craft into parts small enough to be shipped will probably follow the same pattern as the breakdown which Ford is now making on the Consolidated bomber.

It is to be hoped that the "model changeover" can be accomplished without some of the hitches that appear to have developed recently on the West Coast. One of the major bomber plants appears to have had a lag between the completion of a recent bomber contract and the issuance of a new contract or letter of



NEW HOME for "GREENFIELD" Gages

MEMORIAL DAY at "*Greenfield*" was marked by the opening of this new modern air-conditioned plant, devoted entirely to the manufacture of Plain, Thread and Limit Snap Gages. It will more than double "*Greenfield's*" gage manufacturing capacity and symbolizes "*Greenfield's*" determination to cooperate in every way with the national defense program.

The most modern machinery and complete air conditioning will materially assist our hundreds of trained and experienced gage workers to maintain the closest possible control over manufacturing conditions. Even with the greatly enlarged output that the new building makes possible, individual quality and accuracy will be maintained and increased.

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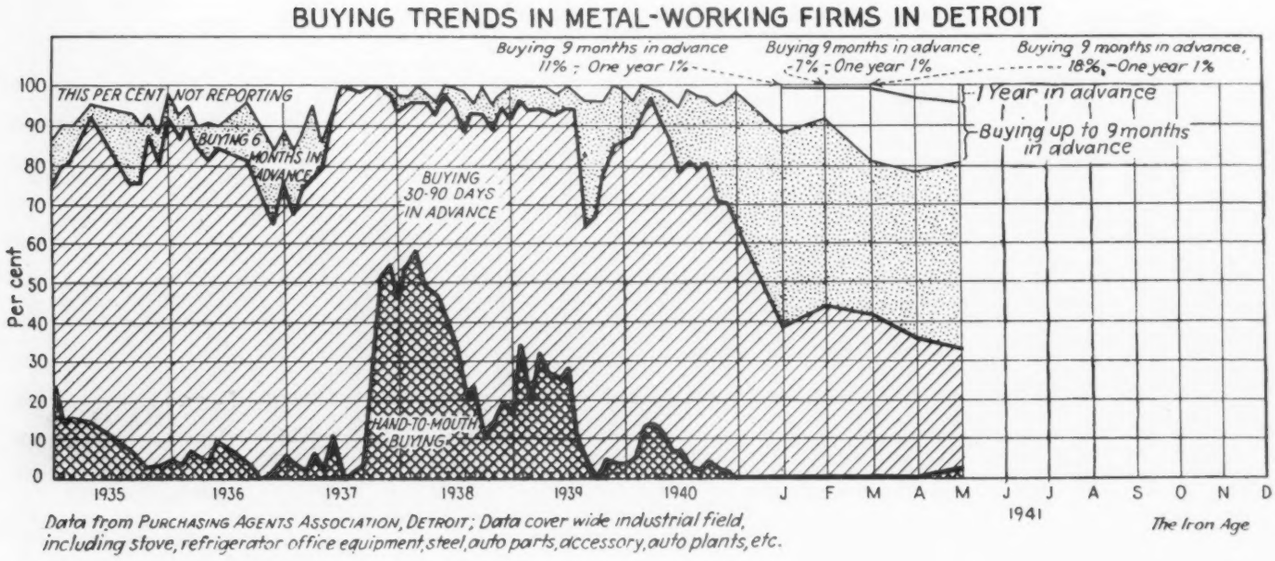


intent on the same type plane. As a result, almost simultaneously with the time lost in the Consolidated strike, this plant was laying off men and was forced to lose valuable production time. So far as can be ascertained, there were no design changes involved; it was simply a matter of waiting for orders. With the choice of type of bomber swinging from one design to another (from twin-engine to four-engine), the manufacturer probably was in a quandary and could not go ahead with production until the intentions of the government were made clear.

Single Design For Big Bombers

Demand for the four-engine bombers is so great that a coalition of plane manufacturers will concentrate on a single design of these air mammoths—the Boeing B-17 bomber. Major assistance will be supplied by Douglas at Santa Monica, Vega (Lockheed subsidiary) at Burbank, and at Boeing's Stearman division in Wichita, in addition to manufacture by Boeing itself.

Among airmen and airplane manufacturers the four-engine bomber is accepted as today's best weapon, despite an English aviation writer's assertion (in a book since withdrawn) that the B-17 bomber was just a "big target." These, and even bigger bombers, are advocated as the best means of dealing with fleets at sea and are regarded as suitable opponents for battleships.

An instance of seemingly wasted effort (although perhaps there is some logical explanation) is the fact that some of the firms which have carried out educational orders successfully have had no follow-up from the government. Here in Detroit an example that has aroused some private comment is the educational order for 75 mm. shells which was placed with Chrysler. The company set engineers and production men to the task of studying shell production, established an experimental forging and machine line and turned out a quantity of shell. Now the machinery is being moved out by the government and the men trained for these operations are shifted to other jobs.

Recent reports on new engines under development indicate that one which Continental has experimented with for a long while is near the production stage. It is a large-size, high-power, liquid-cooled aviation engine. Chrysler, which announced in a report to stockholders this spring that it had a large aviation engine (reportedly 2000 hp.) under development, has recently exerted a lot of additional effort to bring the experimental work to a peak. This engine, however, appears to be at least months from production stages.

Published reports that Ford contemplates casting the crankshaft for his new liquid cooled aviation engine have brought some expressions of doubt "because the tensile strength wouldn't be great enough." It's up to Ford to cast the crankshaft, of course, but it may be of interest to record here that in a tabulation published in "Casting Steel for Ford Tractors" in The Iron Age, Feb. 15, 1940, R. H. McCarroll, and E. C. Jeter of Ford Motor Co., recorded tensile strengths ranging upwards to 221,000 lb., per sq. in., elastic limit up to 212,000 lb. per sq. in. and other data on physical properties of cast steels which might surprise even engineers who investigated these materials only a few years ago.

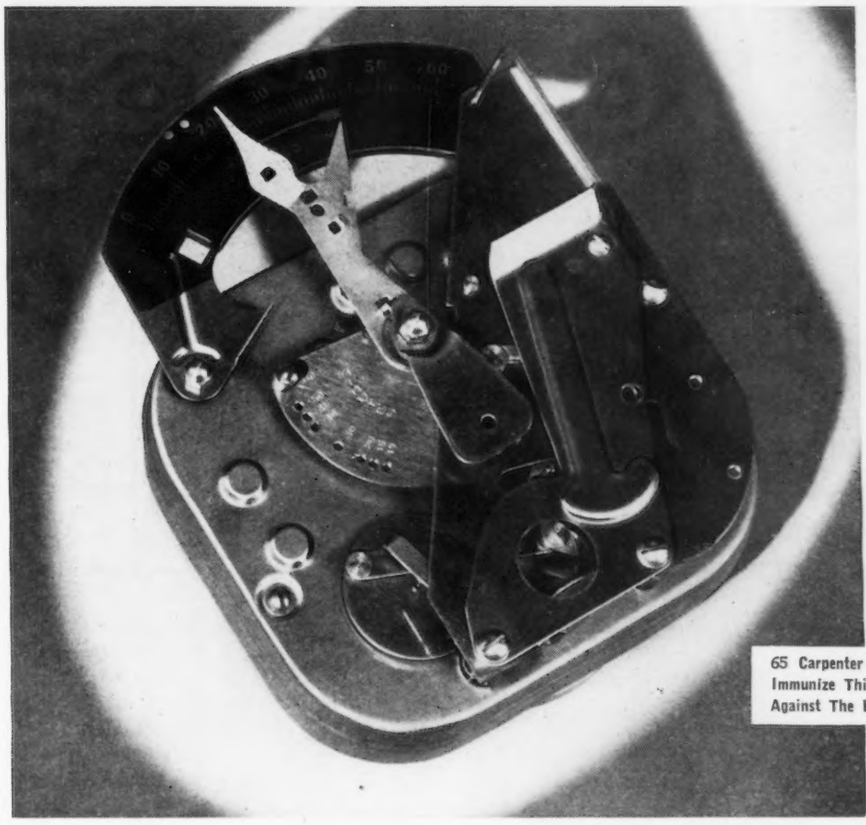
Ford Rushing Program

The development of one of these big aircraft engines is a long-term job for any organization but Ford has every hope that the engine designed at the Rouge will be in production ahead of what might be termed a "normal" schedule. Ford isn't finding any short cut, but has a lot of man-power involved in this development program and is drawing heavily on the experience at licking such peculiar problems as the casting of the V-8 block, casting crankshafts, camshafts, steel pistons, etc. Visitors to the Rouge have seen samples of all the major parts of the engine, some of them being machined in recent weeks. It is just about time now for the engine to roar into life on a test stand to show what it can do.

Another phase of Ford's participation in the defense program possibly will be a major enlargement of the Ford magnesium foundry in the near future. Ford has just got into production with this unit and is shipping parts to Pratt & Whit-

(CONCLUDED ON PAGE 97)

IT TAKES *Stainless Steel* TO LICK A HURRICANE!



65 Carpenter Stainless Parts Immunize This Parking Meter Against The Elements.

This story starts in New England with the big wind of '38. After the storm had whirled its violent course up the valley of the Connecticut, hundreds of parking meters were found destroyed. In one wild night, corrosion equal to years of normal service had penetrated to vital mechanisms hitherto supposed to be inaccessible to the elements.

Now 65 vital parts—every part where corrosion could possibly cause operating failure or even poor appearance—are being made from Carpenter Stainless. Formed parts are fashioned from clean blanking, ductile, Carpenter Stainless Strip. Machined parts are turned out from Carpenter Free-Machining Stainless Steels. To meet the various technical problems, 3 different analyses of stainless are being employed.

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BY L. W. MOFFETT
Washington Editor

• While the New Deal (remember) once shouted for economy, departments with no defense work continue to get record appropriations . . . Psuedo-defense activities help increase federal payroll to 1,300,000 persons.

WASHINGTON — In the past eight years there have been more or less infrequent feints toward economy in government. The present Administration actually—and ironically, considering its terrific spending and debt piling spree — made economy one of its chief planks in its 1932 platform. It was terribly excited over the comparatively mild debt built up by Mr. Hoover and berated him fiercely for driving the country toward bankruptcy. A big noise was raised that government costs must be cut 25 per cent. But soon after something happened. The forward thinkers gained dominance in the then sprouting New Deal. Cost be hanged — that was the slogan. The lid was off. Many thought then as they think today that political power with perpetuation in office was the principle underlying the fatuous idea of spending the country to prosperity.

It turned out to be as had been widely feared, a political gag, funny and gratifying to its ambitious perpetrators but grim and disheartening for taxpayers who have to foot the bill. Making over America as proposed by starry-eyed visionaries in soft jobs with high sounding titles and wholly unearned pay proved extremely costly. But since to the spenders it was vicarious costs that did not and does not concern them. They have gone a considerable length toward making over America and many there are who remain in the hope of completing the task. If successful, the remade America will be a socialized America, government-owned and operated industry with the people wards of the government whose number has already grown to fantastic proportions.

Many On Glorified Dole

Long before the present emergency developed, the number on the Federal payroll had reached an unprecedented total. Under the guise of "defense" the number is rapidly expanding. On the payroll are many hardworking underpaid workers. By the same token there are many parasites, hangers on, who would be overpaid no matter how small their glorified dole from the treasury.

Meanwhile, economy insofar as it relates to government costs has become an almost lost word. Still occasionally mouthed, it only evokes sardonic mirth. That is because it has so often been spoken but never practiced. Quite the contrary, extravagance has raged unabated on a gigantic and ever growing scale. By extravagance is meant unnecessary spending and this has no bearing on defense costs for it is of course agreed that no matter how great there can be no ceiling on necessary costs for defense. And as great as they have been and as much greater they will be, the best economy has been seen in intelligent defense buying.

The difficulty is that there is no effort to slash non-defense costs. It is the other way round. Departments and bureaus that have no association with defense work have managed under bogus disguises to get classified as defense outfits and have succeeded in having appropriations and staffs kited. Many of them spent much of their time in activities that like those of WPA, NYA and a score of other alphabetical soup agencies, had the characteristics of boondoggling. An example is the Federal Trade Commission which, for want of something better to do, assures bigger appropriations and personnel by scaring up piddling cases, issuing complaints and spending a lot of time, money and "work" on them after which it blossoms forth with more or less profound cease and desist orders. This agency has broken into "defense" classification under some pretext or another. Other outfits in the massive bureaucracy also have made that grade and expand accordingly, as they plunge into brain dives thinking of grandiose schemes that provide excuses to keep up and enlarge the payroll.

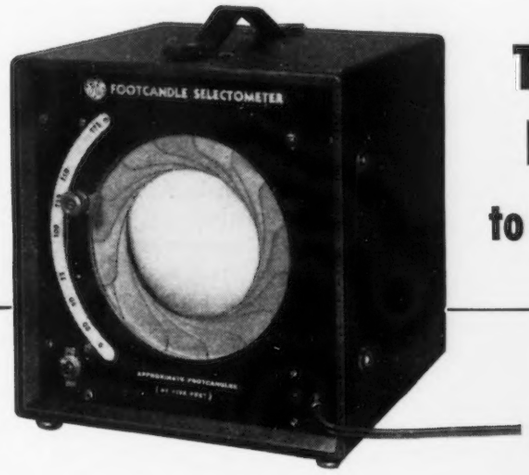
These pseudo defense activities, manna for patronage-mad politicians, have played a considerable part in making Washington the nation's No. 1 boomtown, so jammed in government owned and rented buildings and on the streets that its confusion gives it the earmarks of a modern Babel. The rapid and artificial growth of Washington, while attributed wholly to defense demand for workers, is due in no small degree to the expansion of civilian bureaus that have by specious, easy argument horned into the defense classification but are only wasters of money.

200,000 More Than In 1918

This constant bulge in the Federal civil payroll of 1,300,000, already some 200,000 above the peak employment during the World War—has made a crowded sardine can of Washington with its 300,000 Federal employees, 42,000 of whom are classified as defense workers. The government, in addition to packing its own huge buildings, practically confiscates private space, in both public and private buildings. Some of the latter include "mansions" that in the days of what the reformers call crinoline Washington were the scenes of festivities hosted and hostessed by the wealthy who the past few years have moved to other points. Still the demand is for space and more space.

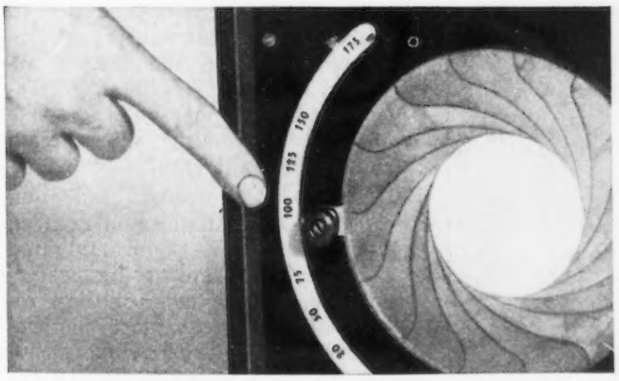
THIS LITTLE BLACK BOX MAY HOLD THE SECRET

to better production in your plant!



1. THIS LITTLE BLACK BOX is an amazing new device . . . the G-E Footcandle Selectometer. It isn't for sale, but any G-E lighting man will gladly show you how to use it and let you see for yourself how various amounts of light affect different operations in your plant. For example . . . take any job where fast, accurate seeing is necessary, as in operating a high-speed machine. This represents not only a sizable investment in the machine but also in the training and skill of the operator. Unless he has enough light for fast, easy seeing, he tires more quickly, makes more mistakes, and a lot of the precision value of the machine and the workman is lost. Good light is needed, but how much?

2. HERE'S WHERE the G-E Footcandle Selectometer makes it possible to select the amount of light you would like for easier seeing. It works on a simple principle which increases or decreases the amount of light you direct on the job . . . anywhere from 0 to 175 footcandles. After experimenting, you can tell when the light seems best to you. Let the machine operator try it too.



3. TAKE A CLOSE LOOK at the footcandle reading on the dial. 90 footcandles? That's the amount of light your eyes said they wanted for that particular job. It may be two, three, or ten times the amount of light regularly used at that machine. But it is the amount of light that your eyes prefer.

4. TODAY IT MAY SEEM impractical to provide general indoor illumination of 100 to 200 footcandles, but it is possible to get 50 to 100 footcandles with G-E MAZDA lamps . . . incandescent, mercury, or as many plants are doing, with G-E MAZDA F (fluorescent) lamps. Ask your G-E lighting man or electric service company for a G-E Footcandle Selectometer demonstration.

5. SEE YOUR G-E MAZDA LAMP DISTRIBUTOR for a wide choice of Tested-Certified-Guaranteed fixtures, complete with G-E MAZDA F lamps ready to hang up and turn on. General Electric does not make fixtures for MAZDA F lamps, but recommends Fleur-O-Lier or RLM certified fixtures. For information, write General Electric Co., Dpt. 166-IA-G, Nela Park, Cleveland, O.

New QUANTITY LAMP DISCOUNTS

Quantity purchasers of G-E MAZDA lamps . . . incandescent, fluorescent, mercury, or any of the thousands of types of large lamps that G. E. makes . . . can now buy $5 worth for $4, $15 worth for $11.25. In addition, there are new larger discounts for contract purchasers. See your G-E MAZDA lamp supplier today!

G-E MAZDA LAMPS

GENERAL ELECTRIC

Made to stay brighter longer

The upshot of this ever-increasing payroll—no effort is made to cut down employment in civilian departments and transfer the employees to real defense work—has been to create an acute shortage of office and housing space in Washington. As the gravity of the problem grows with the accretion of about 1000 new workers weekly, the Administration is desperately seeking a remedy but not by cutting down the payroll. Not at all. Rather it has assigned the Budget Bureau the task of "decentralizing" Washington. It is trying to push 15,000 non-defense workers out of the capital to other cities so that the spreading army of defense workers can move in, a plan that, as might be expected, has aroused the prospective victims of the purge.

Among the really hard working, efficient agencies that are being considered for transfer from Washington is the Interstate Commerce Commission. Others in the list, including some of value and other whose abandonment would be wholesome for the country, are the Railroad Retirement Board, General Accounting Office, Internal Revenue, Agricultural Adjustment Administration, Securities and Exchange Commission, Wage-Hour Division, Federal Trade Commission, Bureau of Old-Age and Survivors Insurance, Federal Communications Commission, Home Owners Loan Corp., Federal Housing Administration, Farm Credit, and Federal Deposit Insurance Corp.

A considerable portion of these are New Deal alphabetical soup outfits but it is a long way from a complete list of them for they run from A to Izzard. And they are still growing in number and costs with little prospect that they ever will be abolished while America is being "remade."

A moratorium on social gains and the business-as-usual policy with accompanying economy would inspire more enthusiasm for the defense program.

OPM Calls for Steel Car Specifications Avoiding Copper, Zinc

Washington

• • • **Taking a new turn in means** of conserving vital defense needs, the OPM limited blanket rating extended to 60 car builders last Thursday calls for revision of specifications for steel so as to avoid use of copper or zinc and substitution of wood wherever possible in the construction of new cars. It was also requested that designs and specifications be compared and corrected so as to provide for use of general standard sizes of steel sheets and standardization of various attachments, devices and appliances.

The order, announced by OPM Priority Director E. R. Stettinius, Jr., not only provides the rating already extended by OPM to airframe makers and builders of ships but is similar to a civilian allocation program promulgated on June 9 by Leon Henderson, OPACS Administrator, except that Mr. Henderson for some unexplained reason treated railroad transportation as a civilian activity whereas OPM treats it as a defense industry.

It never has been made clear why both agencies are providing identical preference deliveries of material for construction or repair of railroad, industrial and mine freight cars. The Henderson statement attempted a vague explanation that OPACS acted under authority to "allocate residual supplies of scarce materials among competing civilian demands after needs of the armament program are satisfied."

Mr. Stettinius assigned the reason for the ratings to the "growing tightness in the supply of freight cars." In different language this was the reason assigned for the "civilian" allocation by Mr. Henderson who spoke of the "impending shortage in railroad freight cars."

The OPM, however, issued an order with particularized ratings, whereas the OPACS promulgated a general program giving preference to defense over civilian requirements yet the more comprehensive OPM order obviously covers the same program.

The rating provided in the OPM order is A-3. This puts the requirements for freight-car con-

THE BULL OF THE WOODS — BY J. R. WILLIAMS

WHUT WE GOT ON FER TONIGHT, MAC? OH, YOU DON'T NEED TO CLEAN IT, MAC, I'LL CLEAN 'ER UP WHEN I COME ON!
I'LL RUN THIS LATHE ON THIS SHIFT, YOUNG FELLER, AN' STAY HOME ON YOUR SHIFT!
POOR MAC-- IT'S BAD ENOUGH TO KNOW THAT SUCH A STUPID LOOKIN' BOOB CAN RUN YOUR MACHINE, BUT TH' GUY COMES IN EARLY AN' HANGS AROUND SO EVERYBODY SEES HIM!
WELL, IN THIS SPEED-UP THEY HAD TO PUT ON THREE SHIFTS, SO MAC DON'T NEED TO BE SUPPRIZED IF HIS OTHER PARTNER IS A TRAINED SEAL!
T. M. REG. U. S. PAT. OFF. COPR. 1941 BY NEA SERVICE, INC.
STRANGE BED-FELLOWS
J.R.WILLIAMS 7-4

OPM Acts To Reduce Nickel in Stainless

Washington

• • • An order designed to conserve nickel by reducing the amount of primary metal used in production of nickel-bearing stainless steel was issued last Thursday by E. R. Stettinius, Jr., OPM Director of Priorities.

The order says that in the production of nickel - bearing stainless steel products, the amount of primary nickel to be used may not exceed 40 per cent of the total nickel content in such steel. The rest of the nickel content must be made up of nickel-bearing scrap.

The net effect of the order it was stated, is to require that, for every 100 lb. of nickel going into the production of stainless steel, only 40 lb. can be primary metal and the other 60 must come from scrap.

The limitation does not apply to stainless steel ingots already cast on the effective date—June 17—of the order and which may be shipped without regard to the limitation.

struction and repairs behind the top needs in the A-1 classes, but puts them ahead of the less essential needs with lower ratings. In the order it is provided that the rating can be used to facilitate the obtaining of materials and equipment entering into freight-car construction, including railroad, industrial and mine freight cars. Car builders who use the rating, including railroads which build their own cars, can extend it to their suppliers by executing copies of the order and serving it on their subcontractors.

The rating extended to the car builders applied not only to orders for critical materials but also to orders for cutting and other perishable tools and equipment. The rating does not cover machine tools, however, and the rating for machine tools and similar production machinery must be obtained in the usual manner by application for preference rating certificates.

The general preference order is applicable to material and equipment entering directly or indirectly at any stage of construction, into the construction of freight cars by the producers who are granted use of the A-3 rating.

War machines and munitions have to be good to stand up under war conditions. They must be made rapidly in huge quantities by a variety of plants. All parts must be strictly interchangeable.

Hence the task of guarding quality becomes a matter of life and death importance to a nation rearming to preserve its liberty.

Sheffield Visual Gages are stalwart guardians of dimensional quality. They are used in checking dimensions of manufactured and purchased parts, tools, production and master gages.

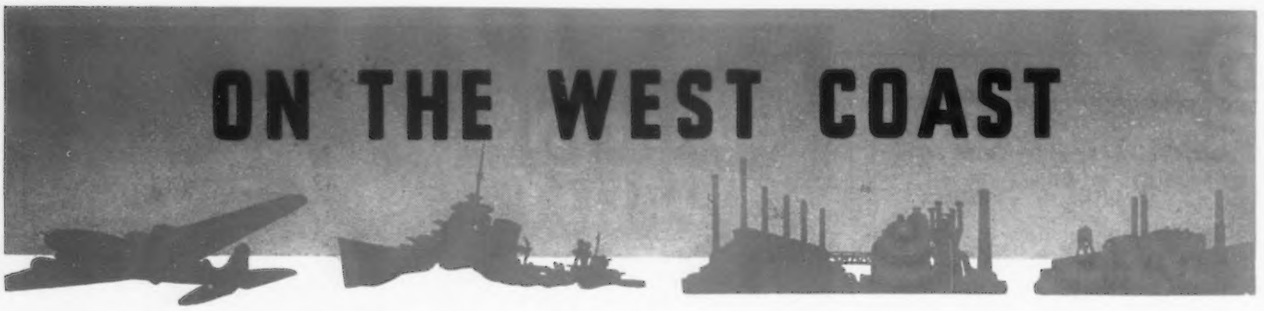
The sturdy Reed Mechanism, combined with the light beam lever arm, provides a sensitivity to meet the highest precision standards of measurement—but without the delicate fragility so often associated with sensitivity.

These gages are not delicate, they are strong and deadly accurate. They are made in various models to check accurately to thousandths, "tenths" or millionths of an inch and all provide rapid, easy gaging to any limits required on production work.

Write for information.

THE SHEFFIELD CORPORATION
Gage Division · DAYTON, OHIO, U.S.A.

SHEFFIELD MASTER GAGEMAKERS



SAN FRANCISCO—Probably no section of the country has been awakened from such a sound industrial sleep and suddenly been summoned to vigorous defense activity than the Pacific Northwest. Thus, it is no wonder that this section is taking a longer time than some of the more heavily industrialized parts of the country to get the sand out of its eyes and meet the demands of a shipbuilding center, a large Navy yard, an active aircraft industry, as well as standing sentry duty at the gateway to a militarized Alaska.

• Impact of defense program rocks Pacific Northwest, where 500 skilled machinists are idle . . . Pooling of mechanical resources will come slower in that area . . . Equipment shipments slower because of great distances.

Last week a Seattle industrial engineer, apparently without any lathes to sell, completed a survey of small machine shops in Washington, Oregon, and Idaho. He found that the great majority of these small shops have at least 65 per cent obsolete equipment, making them valueless as potential contractors for Army, Navy and aircraft precision work. His tabulations also showed that there are one and a half million dollars worth of first class machine tools in the Northwest that are idle. This quantity would not cause a tear drop in heavy industry centers, but in the Northwest, which had been forgotten by heavy industry until the last year, it is enough to cause a community wail. Furthermore, from 400 to 500 skilled machinists are idle at a time when their talents are at a premium.

An Industrial Frontier

Pooling of mechanical resources will come in the Pacific Northwest as it has in other sections of the country, but it is going to take a longer time to get these few facilities working together and to work out a system of remuneration on the basis of machine hours in this industrial frontier than in any other part of the country.

To further complicate the problem, the great distance from production centers seems to have resulted in later deliveries of industrial equipment than in other sections where fingers are closer to the pot. Associated Shipbuilders, Seattle firm with a contract for four Navy seaplane tenders, complains that steel deliveries put it several weeks behind on its contract, but apparently this situation now has been taken care of. Part of the difficulty lies in the Northwest ports being the last ports of call for intercoastal vessels, and with California customers calling for all available cargo space, ship operators are not overly anxious to continue runs to the Northwest.

Tin Must Be Brought In

Exploratory work of the United States Bureau of Mines for strategic mineral deposits in the Western states has met with varied success. Almost no tin has been discovered despite investigations of large areas in South Dakota and in Catron County, New Mexico, and more recent investigations in the neighborhood of Spokane, Wash. No matter what price Uncle Sam is willing to pay, he still will have to get his tin elsewhere.

Development prospects for low grade manganese deposits are more favorable. An ore deposit near Las Vegas, Nev., with over a million and a quarter tons of ore is now believed to contain over 300,000 tons of metallic manganese.

M. A. Hanna Co., Cleveland, is actively pushing tests of beds which it controls in the Artillery Peak district of Arizona. The Bureau of Mines estimates that the Artillery Peak deposits contain approximately 761,000 tons of metallic manganese in ore of sufficiently high grade to be worked in an emergency. In addition, 150,000,000 tons run from three and a half to five per cent, but the concentrating problem with this ore is almost insurmountable.

The Bureau's Manganese pilot plant at Boulder City, Nev., is expected to go into operation momentarily. Low grade deposits in the neighborhood of Puget Sound, Wash., are being actively operated on a small scale. One producer there expects to concentrate the ore by an electrolytic process.

Chrome Outlook Encourages

The chromite investigations are also encouraging. One deposit near Dunsmuir, near the northern border of California, is showing ore assaying as high as 45 per cent. Active operations seem probable in a deposit in Stillwater County, Mont., rated as "light low grade to subcommercial." A. H. Wild, developer of the Wild Rustless Iron Process, is reported to have leased and to be developing properties in Whatcom County, Wash.

Still further expansion of magnesium production, in which the Henry J. Kaiser interests are the largest and most widely publicized, seems likely. Probably the next big magnesium development will be in northeastern Washington, where the Kaiser interests are reported to be ready to undertake development as soon as electric power from Grand Coulee Dam is available.

Tungsten production previously has been reviewed in this column.

Overshadowed by labor friction in other Pacific Coast districts, a labor contract signed last week by Solar Aircraft Co., San Diego, and a local of United Aircraft Welders,

an independent union, is regarded as a model for some of the larger companies and unions. Strikes, lockouts and discriminations are barred, and all disputes are to be submitted to arbitration.

Avoids Fundamental Issue

Recommendation of a closed shop agreement between Bethlehem and Local 68 of the AFL Machinists' Union at San Francisco by the defense Mediation Board is regarded as a face saver to lure this union back to work. It does not settle the more fundamental questions of the strike, however, and has no direct relation to the CIO Machinists' strike across the Bay in Oakland.

No limits to the extent which Pacific Coast shipbuilding facilities may be expanded is yet visible. Any program stating a definite number of vessels is regarded as only transitory with only ultimate limitations being availability of steel and capable contracting organizations.

Last week Consolidated Steel Corp., Los Angeles, applied to the Harbor Commission for lease of a 90-acre site coincident with approval by the Maritime Commission of the expenditure of $3,000,000 for a new yard to be built there. Four new ways would be constructed immediately, with four more to be built later. This new yard will represent an expansion of nearly ten times Consolidated's present facilities where ten ships are under contract. This new yard probably will participate in the tanker construction program. Todd-California, at Richmond, plans two more ways, indicating an expansion of its contract to build 30 ships for Britain at this yard.

Fourth Planned for Coast

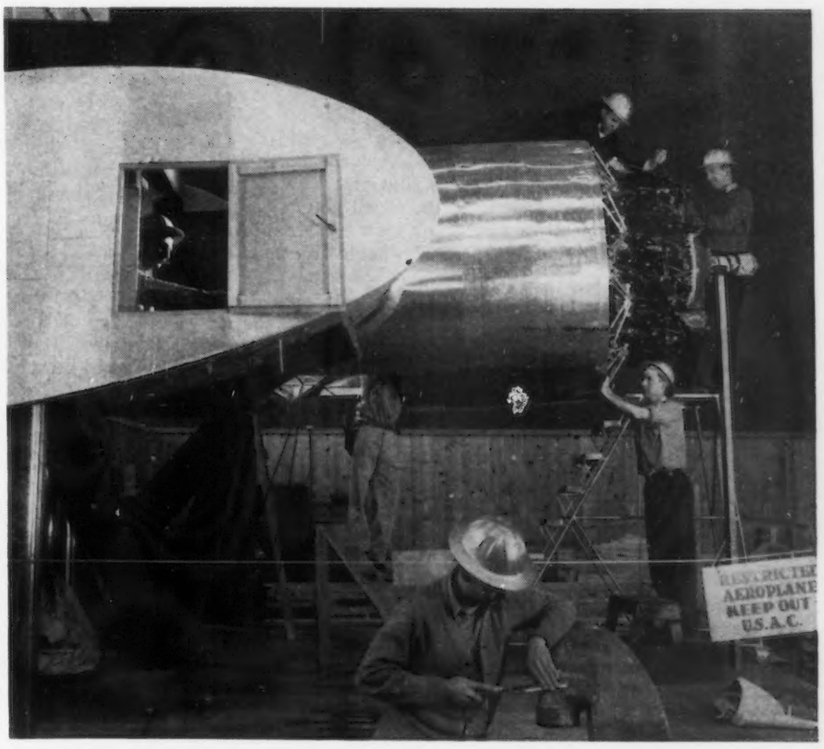
John A. McCone, president of California Shipbuilding Corp., Southern California Todd-Kaiser affiliate, pointed out that in the last war 2300 vessels had been built in this country when peace put on the brakes. The Maritime Commission program so far, he said, officially contemplates only 753 ships, indicating that this limit is extremely elastic. McCone believes that the West Coast will construct approximately 25 per cent of the ultimate program.

Incidentally, the 25 per cent allotment for the Coast has appeared more than once in other defense production programs, and is being roughly used as a standard factor in computing the far West's share of defense appropriations excepting, of course, aircraft, in which the Coast will have a somewhat larger slice even when Midwestern plants are fully into production.

X-ray inspection of airplane parts continues to gain in favor. Triplett & Barton Laboratories, whose mass production methods have received much attention in this field, state that X-ray inspection is now mandatory on all stress parts going into United States Army and Navy, and British military planes.

Lockheed Starts Training Courses

Lockheed Aircraft Corp. has inaugurated training courses for members of the materiel division of the Army Air Corps in the assembly, maintenance, and operation of the P-38 interceptor. This training is a function of Lockheed customers' service department and includes practical mechanical work on the plane, lectures by Lockheed P-38 group engineers, test pilots, shop experts, and representatives of firms building important components. The customers' service department is also training its own instructors to be ready for call by Army air depots. Uncle Sam is an important customer and he is getting just as much if not more service than a private buyer.



KEEP OUT: The U. S. Air Corps demands privacy as it puts the finishing touches on the power plant of the world's largest airplane. This Douglas XB-19, has four 2000-hp. Wright Cyclone engines.

Fatigue Cracks

BY A.H.DIX

Table-Turner

• • • This ad in the Situations Wanted columns of the *Newark Evening News* caught the eye of E. Echikson, president of the Pioneer Tool Co., Bloomfield, N. J.

> TOOL MAKER desires connection with an intelligent employer; must give names of former employees of past 10 years as references; depression bosses (the speed type), including those not believing in advertising for their help need not apply. Address S. J. D., Box 190, News office.

Man bites dog.

Nippon Nosegay

"Your column is a spice of life. Across the vast Pacific it has been cracking my fatigues many a time."

This cheering word is from Mr. Roxy Siota of the Institute of Physical and Chemical Research, Tokyo. But because of the cautious indefinite article in the first sentence, we are only moderately grateful.

Mr. Siota goes on to say, "May I ask your readers to define the word *feage?*" Lest the search for the meaning of this word coined by Mr. S. seriously delay defense production, we hasten to explain that it means IRON AGE—Fe + age. But Mr. S. leaves us guessing with his ending, "Your feal reader." The best we can make of it is "Your ironical reader."

Stopper

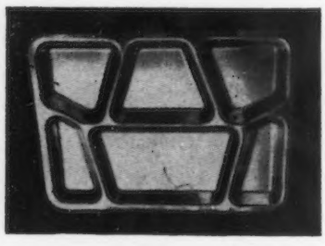
• • • What! Sixteen Inches to the Foot? — *Wickwire Spencer Steel Co.*

Gently Lethal

• • • The happiest euphemism we have run across recently is the Army's name for a land mine that shoots slugs at enemy troops. It is called an "antipersonnel mine," which makes it practically painless.

Gastric Juice Flood Producer

• • • In other ways, too, we observe a decided softening up in the Army. The Government Awards section of your favorite family journal reports that the J. W. Fiske Iron Works has received an order for, of all things, porch benches. We are expecting any week now to see a contract given for chaise lounges, with wheels, for parade ground use.



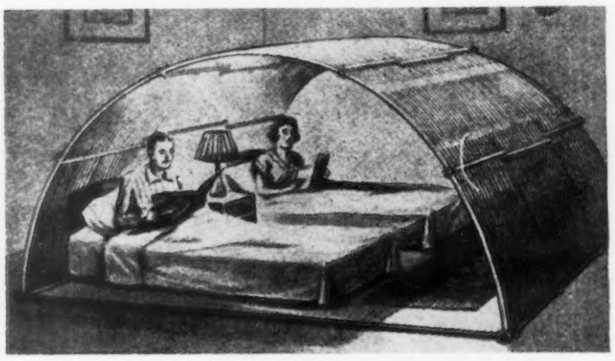
And that isn't all. In the latest issue of the *USSteel News* we saw this photograph of a stainless steel mess tray, which, we quote, "eliminates the need for dishes." There are those who fought through the last war without knowing that the Army owned a dish.

Not the least of the horrors of the previous effort to save democracy was the old-fashioned mess kit. None but the most experienced juggler could prevent his beefstew from alloying his bread pudding, and the gravy was always sure to break through the dike of mashed potatoes and find its way into the rice pudding.

After a couple of weeks of that, the thirst for action became acute, the soldier feeling that he had nothing to lose. But now all is changed. The Army will do well to treat the new mess tray as a military secret, for once the news gets around that every meal is a blue plate special, voluntary enlistments might mount to such a point as to interfere seriously with the draft program.

Metal Tent For Morpheus

• • • And just to acquaint you with the latest manifestation of war's stimulating influence on the metal products industry, we show here a cozy indoor shelter now on the English market and selling for about $180.



Courtesy The Ironmonger.

Salami For Devil Dogs

• • • Our neighbor toward your left hand, Charles T. Post, who writes the ever-lively "On the West Coast" (see page 70), sends us this item from a list of Navy requirements:

> *Bids will be received by the Marine Corps Base, San Diego, for 2430 spare parts for electric meat slicer; Sch. 344.*

It looks like either a long war or the mess sergeant is crazy about cold cuts.

Pushed Into Lethargy

• • • With the iron and steel delivery situation in its present highly delicate condition, the market section is, of course, "must" reading for everyone in the industry. With a marketwise reporter stationed in every center of any consequence we are able to acquaint you with developments almost before they materialize. Our market reporters are doing a superb job, and the only flyspeck we can find is the use of the wrong verb in a recent report. A new ruling was reported to have *shoved* a certain market situation into the doldrums. Doldrums imply inaction. You aren't shoved into the doldrums. You *drift* there. But aside from this everything is perfect. See page 110.

Peace When the Iron Cools

• • • We see by our favorite journal that a seven-year strike of an AFL union against Kohler Co. was recently settled. It seems to us that as in the case of debts there should be some kind of a time limit on strikes and betrothals. Like a bottle of uncorked gin, the fire goes out of them if they stand too long. If, in normal times, a strike doesn't spark within a year at the most it should be declared legally dead from lack of spontaneity.

Puzzles

• • • The answer to last week's insult to your intelligence is, of course, 5 cats.

It seems to us the following problem is one of the most difficult we have ever printed. We wouldn't know how to begin trying to solve it, but then we don't have to, as we have the answer in the puzzle book lent us by Miss Phyllis Yarans, "Whitey" Maurath's right hand:

> *Use the digits from 1 to 9, inclusive, each once, and express a value for one-eighth.*

"Little Steel" Companies Seen Signing SWOC Contracts Soon

By T. C. CAMPBELL

o o o

Pittsburgh

• • • **Philip Murray's five-year** drive to organize workers in the steel industry and obtain contracts between the SWOC and various steel units, is about to reach a successful completion, THE IRON AGE has learned.

Unless factors not now present should change the picture, it is believed that within the next 30 to 60 days the SWOC will have signed contracts either on behalf of their own members or exclusive contracts as a result of elections, with Bethlehem Steel Co., Inland Steel Co., Republic Steel Corp., and Youngstown Sheet & Tube Co.

NLRB elections are being held this week with odds favoring the SWOC at the following Bethlehem plants: Cambria plant, Johnstown, Pa.; Rankin works, Rankin, Pa.; Leetsdale works, Leetsdale, Pa.; Los Angeles plant, Vernon, Los Angeles; and Los Angeles works, Los Angeles. An election had previously been held at Bethlehem's Lackawanna works at Buffalo where the SWOC won by a wide margin. A victory by the SWOC in any of these elections is to result by stipulation in en exclusive bargaining contract for that particular plant.

HOT BOX: This unusual photograph at top of page, described by Australian censors as showing a German tank a few minutes after it had been struck by a bomb, was taken at Tobruk, Libya.

Photo by Wide World

According to informed sources, quiet negotiations leading toward a contract are now in progress between the Republic Steel Corp. and the SWOC and the same conditions, it is understood, apply to Inland Steel and Youngstown Sheet & Tube. These contracts may or may not be the result of NLRB elections, since there is a possibility that some of these companies may accept evidence approved by the NLRB other than consent election results.

It has also been learned that the negotiations now going on between SWOC representatives and National Steel Corp.'s Great Lakes Works, are leading to an election to be held at Great Lakes to determine whether or not the SWOC has a majority. Even though National Steel Corp. may become the last hold-out against the SWOC organization drive,

should contracts be signed by the SWOC and the companies mentioned above, as is definitely expected, Murray will, to all practical purposes, have reached the goal he set on June 17, 1936.

Although Murray and the SWOC obtained a valuable sales talk for their organizational drive on March 2, 1937, when the U. S. Steel Corp., in a history-making change of policy, instructed their subsidiary companies to sign agreements with the SWOC, the respect for Murray's integrity held by various steel executives, despite their personal opinions, has undeniably been instrumental in Murray's successful drive.

Equally as important as the U. S. Steel contracts in helping to organize the steel industry, have obviously been the championing of labor by President Roosevelt, the passing of a National Labor Relations act, and recent decisions handed down by the U. S. Supreme Court. The SWOC at present has more than 717 contracts with steel and metal working companies and claims these contracts cover working conditions for more than 550,000 employees.

Now that the SWOC is about to leave its organizational activities behind it, this young union will now take on the more responsible phase of its work of furthering not only its own interests but those of the companies with whom it has contracts, according to labor observers. It is pointed out here by labor students that a failure to recapitulate gains and dispose of some of the tactics and methods thought to be necessary in the process of organizing, as well as work with industry toward common mutual goals, has often in the past resulted in stagnation and eventually dissolution.

Realistic labor leaders believe that since the SWOC will no longer have to spend so much of its efforts in organization, it will now concentrate on attempting to obtain union shop and check off of union dues among the larger steel units. Already the SWOC has struck out in a new path of negotiations by submitting the question of union shop and check off which was turned down by Wheeling Steel Corp. to the National Defense Mediation Board.

Defense Work Spreads to 10 Small Ohio Towns

By DON R. JAMES

Cleveland

• • • Rambling around in Northwestern Ohio in search of current industrial highlights:

FINDLAY—Close to 1600 persons are employed here in the defense program. Buckeye Traction Ditcher Co., employing around 500 and making tank parts as well as its regular line of diggers, is most active. Smith Bros. Mfg. Co. is working on ammunition components and parts for the Navy, and has a payroll of 100 on two shifts.

LIMA—Industrial employment is highest in many years, with around 11,000 now on payrolls. Lima Locomotive Co. has 2300 workers and will hire more. The company is building tanks for the British in a new $300,000 factory. Ohio Steel Foundry Co. has much diversified work including a large backlog of steel company orders, and is running two shifts.

BRYAN—Aro Equipment Co., aircraft parts maker, has been going like a house afire here, on propeller hub assemblies, hose and valve assemblies and other parts. Around 1700 are employed in defense work in this city.

PORT CLINTON — The Erie Proving Ground has been reopened by the Army for testing guns and other armament items. New buildings are springing up at the post. Equipment from Fostoria High School was moved here to facilitate training workers. Standard Products Co. is the largest industrial employer and holds a big order for rubber grommets.

GREENWICH—Unable to get aluminum for household utensil production, Mrs. Rita Hoffman, vice-president of Kitchen Katch-All Co. here, is in pursuit of defense work. Her 26 employees have been filling in the time on odd jobs such as painting the office and cleaning up stock.

MAPLE GROVE — The big mile-long dolomite quarry operated by Basic Refractories, Inc., is down to the second level and shipments are up sharply. The company's burning operations are conducted at nearby Bettsville. The dolomite is of great purity. Approximately 5000 tons of rock are being processed daily.

DEFIANCE — Factories here are employing about 2100 persons and adding to payrolls steadily. Lectrolite Co. is engaged in shell output and will need more men. Defiance Machine Works, maker of boring mills and other equipment, has recently added 1500 sq. ft. of space. Crawford Tool & Mfg. Co. is getting into production. Defiance Alloy Products Co. has completed its new factory. With skilled labor not too plentiful, training courses are in full swing.

SANDUSKY — The new Plum Brook Ordnance Plant, now being constructed, was doubled in size recently. Between 1500 and 2000 men are employed at the site and 75 are being added daily. Excluding the ordnance plant, around 5700 workers were employed here last month. Farrel-Cheek Steel Co. holds indirect orders for defense; Sandusky Foundry & Machine is building an addition and going full blast on centrifugally cast propeller shaft sleeves for the Navy. G. & C. Foundry and other shops are working extra shifts. Brightman Nut Co. increased its floor space.

FREMONT — Herbrand Co., drop forge plant, is employing about 600 persons and the bulk of its output, including gun forgings, enters the defense program. Other plants are becoming more active on defense work steadily. Cutlery makers are among the holders of direct contracts here.

TIFFIN—National Machinery Co. has been producing at its peak for a long time and adding to its equipment, but can't begin to meet the demand for upset forging machines. Hanson Clutch & Machinery Co. is supplying heavy equipment for use in building military camps. A federal rural national defense night school in shop mechanics was opened recently in the Tiffin Machine & Auto Parts plant.

Coming Events

June 23 to 27—American Society for Testing Materials, annual meeting, Chicago.

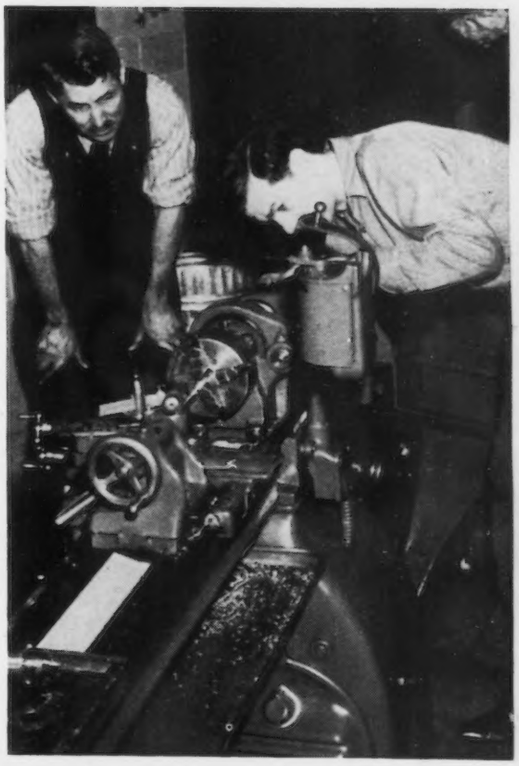
Sept. 23 to 26—Iron and Steel Engineers, annual convention and exposition, Cleveland.

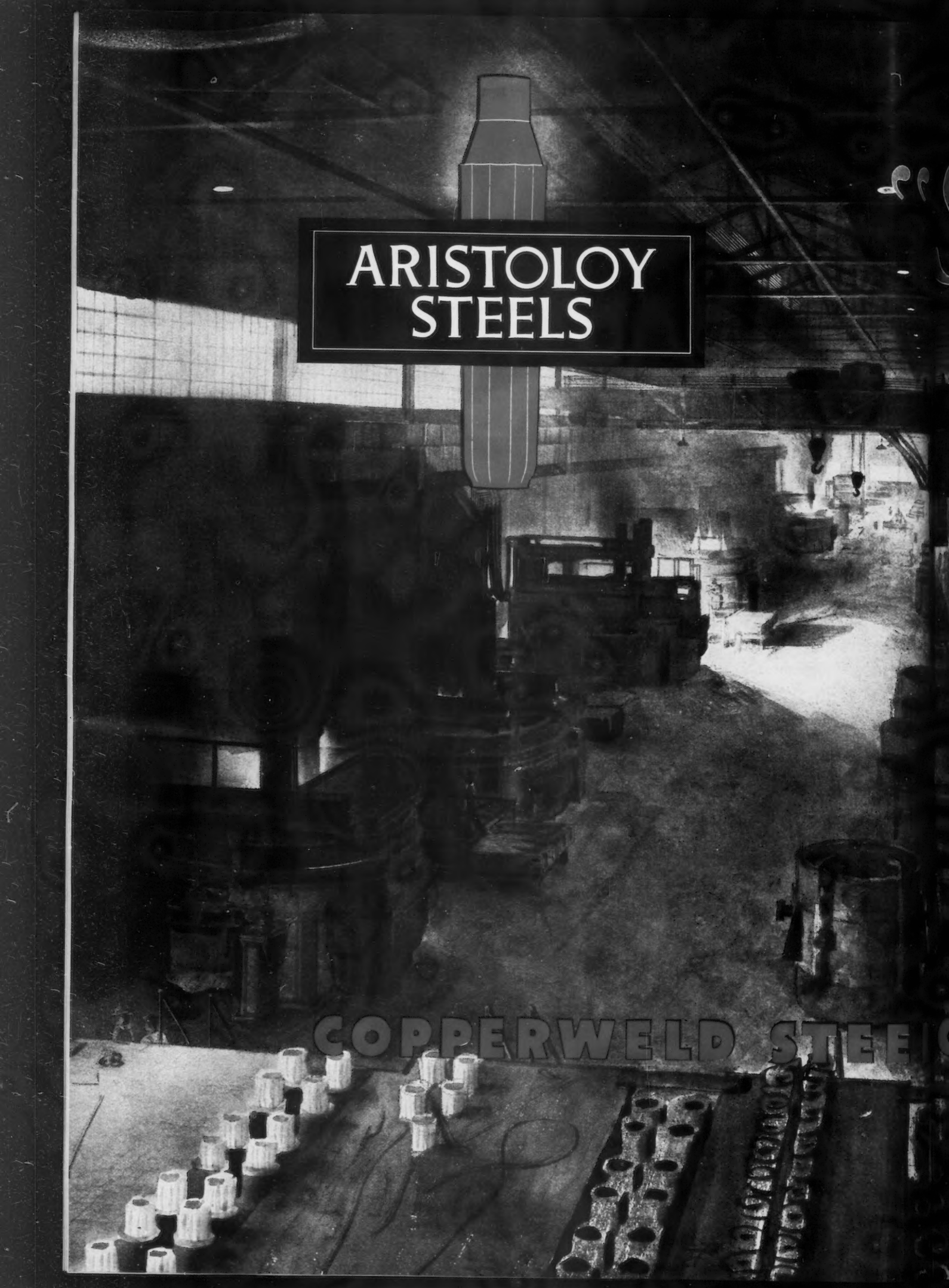
Oct. 1 to 4—The Electrochemical Society, Fall Meeting, Chicago.

Wanted---More Skilled Men

. . . To produce more and still more steel, to manufacture cruisers, destroyers, merchant ships, armor plate, shell forgings and bomb casings, to increase the ever-gaining tempo of U. S. defense, United States Steel Corp. subsidiaries are giving intensive training to 15,000 employees.

This program, resembling training plans in some other big plants, is carried on by men like American Bridge Co. Training Instructor Elder Rice (top photo), supervising a class of four apprentice welders; like National Tube Co. Instructor H. M. Lee (right), teaching lathe operation; Columbia Steel Co. Patternmaker Jerry Becker (left), explaining blueprint reading, and Tennessee Coal, Iron & Railroad Co. Instructor H. D. Tyson, showing an apprentice how to lay brick in a soaking pit floor.




ARISTOLOY
STEELS
COPPERWELD

"Special Quality"

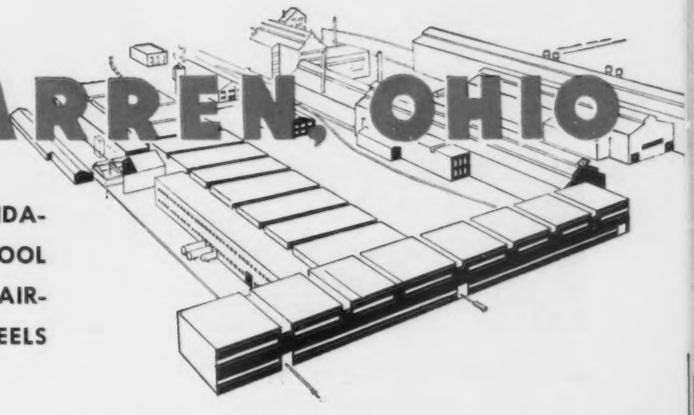
TOOL AND ELECTRIC FURNACE ALLOY STEELS

ARISTOLOY "Special Quality" Tool and Electric Furnace Alloy Steels are the product of an experienced organization of specialty alloy steel-makers—working in a modern plant especially designed and equipped for the efficient production of high-grade electric furnace alloy steels.

Aristoloy "Special Quality" Electric Furnace Steels include Tool Steels, Stainless Steels, Oxidation and Corrosion Resisting Steels, Nitralloy Steels, Aircraft Quality Steels, Valve Steels, Special Steels, etc.

Aristoloy "Special Quality" Tool and Electric Furnace Alloy Steels are melted in small furnaces ranging from 6 to 35 tons (rated capacities), and cast in small ingots using stationary molds and twin nozzle teeming. Our ample heating and rolling capacity, producing a wide range of sizes, can handle the entire electric furnace output. A modern metallurgical and chemical laboratory, centrally located within the plant, controls the quality factors in all operations.

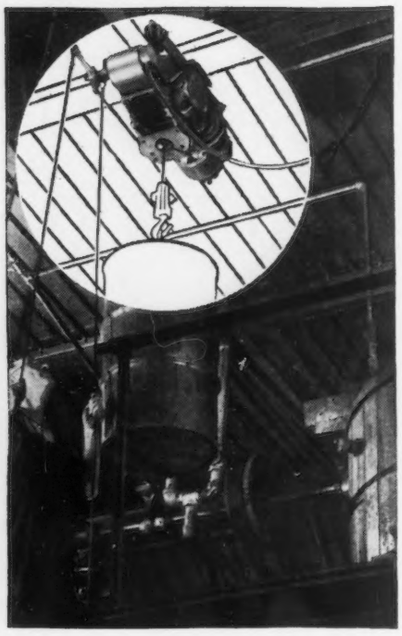
Aristoloy "Special Quality" Tool and Electric Furnace Alloy Steels are available as Blooms, Billets or Bars—Hot-rolled, Annealed or Normalized, Spheroidized-annealed, Heat-treated, Straightened, Turned, Centerless-ground, Cold-drawn, or in any combinations of these conditions and finishes. Blooms and Billets may be either rolled or pressed.



COMPANY WARREN, OHIO

SPECIAL QUALITY BILLETS AND BARS, OXIDATION AND CORROSION RESISTING STEELS, TOOL AND SPECIAL STEELS, NITRALLOY STEELS, AIRCRAFT QUALITY STEELS, STAINLESS STEELS

One MAN-DAY SAVED EVERY DAY



It was just one of those everyday jobs that so often escape attention—raising heavy chemical drums to the high lip of a textile dyeing vat. Three men were required with the hand block and tackle used. Many times each day they dropped their skilled work to do this job.

For less than $300, the company installed a Reading Electric Hoist and Trolley Unit requiring only a small portion of one man's time each day. *Result:* 8½ skilled man-hours per day saved.

National defense and domestic production alike benefit when savings like this can be made. Check your plant again, then write us for suggestions.

READING CHAIN & BLOCK CORP.
DEPT. 27 READING, PA.

READING
Chain Hoists, Electric Hoists, Cranes and Monorails

Barrage Balloons, with Wire Nets, Made in U. S.

Indianapolis, Ind.

• • • **Equipment for barrage balloons**—new to America—is being manufactured here by Marmon-Herrington Co. Such balloons ordered by the government will be as long as 87 ft., will be anchored to wires and cables. Network of wires and cables is intended to trap enemy planes. Marmon-Herrington Co. is producing the winches for raising and lowering of the barrage equipment.

Republic CIO Suit Set Aside

Cleveland

• • • **The suit filed by Republic** Steel Corp. against the CIO and numerous other defendants for alleged damages and "extraordinary expenses" resulting from the 1937 strike has been dismissed by Federal Judge Robert Wilkin here. The suit was filed in May 1939. Judge Wilkin cited the fact that the Supreme Court set aside a judgment in the Apex Hosiery Co. case.

20% Bonus for 600 McGill Mfg. Employees

Valparaiso, Ind.

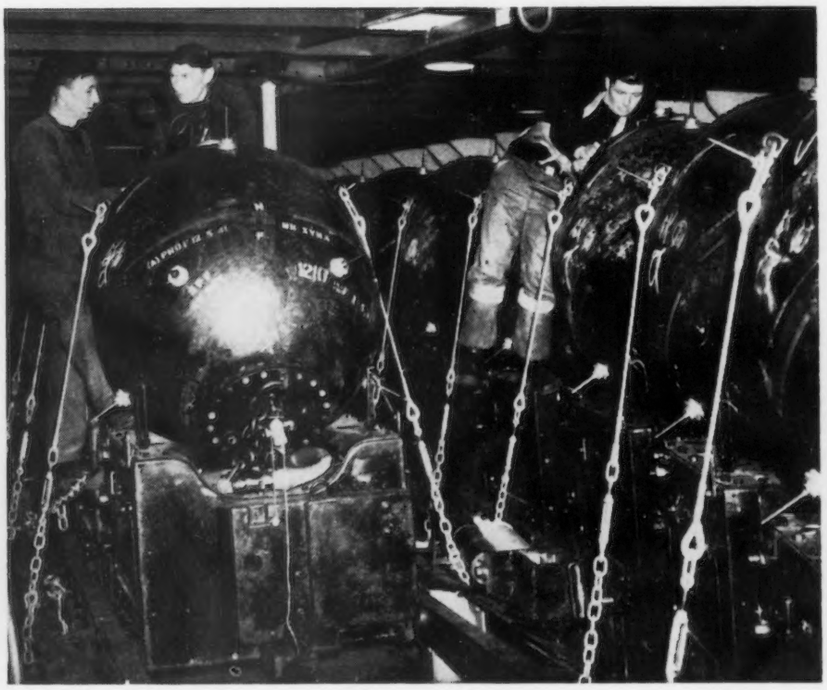
• • • **Bonus of 20 per cent** on last year's salaries for 600 employees has been announced by the McGill Mfg. Co. here. Total payments will amount to about $200,000. Firm manufactures ball bearings, switches, electric lamp guards, golf clubs—in addition to defense contracts on hand.

T. H. Gibson Director of British Iron & Steel Corp.

London

• • • **T. H. Gibson, secretary** of the Iron and Steel Control and the British Iron and Steel Federation, has been appointed a director of the British Iron & Steel Corp. Mr. Gibson, who has been secretary of the corporation since its inception in 1936, has been succeeded by W. G. Tubman, personal assistant to J. M. Duncanson, deputy controller of steel supplies under the Ministry of Supply.

OUT WITH THE MINELAYERS: One of the most important units of the British Navy is formed by the minelayers. Among the dangers these men contend with are (1) enemy bombers, (2) enemy mines, and (3) explosion of their own mines, such as those shown in this photograph being adjusted for dropping into the sea. *Photo by British-Combine*



DEPENDABILITY
PHILO
QUALITY · SERVICE
Ohio Ferro-Alloys Corporation
Canton, Ohio

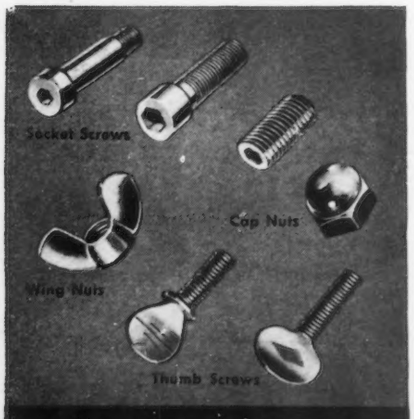
I INSIST ON ACCURACY AND STRENGTH

I INSIST ON GOOD DESIGN

Both of us get what we want in PARKER-KALON Cold-forged Products

PARKER-KALON *Cold-forged* Socket Screws, Wing Nuts, Cap Nuts and Thumb Screws meet the requirements of even the most critical men who specify and use such products. Unmatched in accuracy, strength, design and finish, these *cold-forged* products are demanded by thousands upon thousands of users. Try them. Samples and prices on request, without obligation.

PARKER-KALON CORPORATION
200-202 Varick Street New York, N.Y.



PARKER-KALON
Cold-forged
SOCKET SCREWS WING NUTS
CAP NUTS THUMB SCREWS
SOLD ONLY THROUGH REPUTABLE DISTRIBUTORS

OPACS Claims Scrap is Being Hoarded, Revises Schedule

Washington

• • • **Threatening vigorous** action to end hoarding and warning that higher prices cannot be expected, Leon Henderson, administrator of the Office of Price Administration and Civilian Supply, last week issued a series of new amendments to the May 7 schedule of maximum iron and steel scrap prices. The amendments became effective June 18.

Circulation of rumors that ceiling prices would be raised has caused some hoarding by both dealers and original sellers of scrap, the OPACS chief charged. The price division is collecting names and tonnages involved in such hoarding, he added, and is prepared to take vigorous action, if necessary, to get this material moving into consumption. Present ceiling prices, Henderson insisted, are high enough to compensate the scrap trade fully and to insure adequate supplies of scrap to support present high rate of steel production.

The new amendments deal largely with correcting ambiguities and inequalities existing in the May 7 schedule (see special insert, THE IRON AGE, May 15, 1941) and affect no change in prices of any major prices. Of particular importance are provisions made to permit use of remote scrap. Consumers desiring to purchase material lying beyond a freight rate of $11.20 a ton from Pittsburgh may, after obtaining permission from OPACS and meeting certain other requirements, absorb the required additional freight. However, only amounts in excess of 500 tons per month come under this arrangement.

Provisions are also made to enable the use of "semi-remote" scrap by permitting consumers to pay up to $1 more for such scrap to cover transportation costs.

Bundles Defined

Definitions are given for No. 1 and No. 2 bundles and payment of premiums for these bundles is specifically forbidden. No. 1 dealers' bundles are priced at $1 under No. 1 heavy melting steel and No. 2 dealers' bundles $1 under No. 2 steel. No. 1 bundles are described as consisting of new, clean black sheet scrap, hydraulically compressed in a dealer's yard. No. 2 bundles consist of old fender and body scrap.

The latest revision of the price schedules introduces the use of "maximum shipping point prices" which in effect is an official interpretation of the method to be used in determining point of origin prices for consumers not located in a basing point area.

Several consuming points have been dropped in the revised price schedule, while several new points have been added. Chief adjustment in prices is in the cast items, except that all prices at Sparrows Point, Md., have been boosted 50c. No. 2 cupola is no longer quoted.

The section dealing with brokers' and dealers' commissions has been amended to read that "a dealer who has never acted as a broker prior to June 18, 1941, shall in no case be allowed a brokerage commission." The new schedule reiterates that rerolling rails must be diverted to rerolling mills and not cut for melting purposes.

Detailed Reports Required

Detailed reports must now be made by consumers on the 15th of each month showing every purchase, price and from whom bought. In addition a statement of consumption and stocks must also be given.

So far as railroad scrap prices are concerned, the only notable revision is in the section dealing with scrap originating from railroads not operating in any of the basing points listed in Schedule B. Other sections are to all purposes unchanged from the original setup (see special insert, THE IRON AGE, May 15, 1941).

The new railroad scrap amendment is as follows: Maximum price of any grade of such scrap delivered to consumers located on and off the line of the railroad not operating in a basing point shall not exceed: For the grades

Method of Computing Export Prices Given

• • • The new method of determining export prices for scrap iron and steel, announced June 18 by OPACS, is shown below. In all instances the domestic broker's commission, if any, may be added. All extra costs must be shown as separate invoices.

OTHER THAN RAILROAD SCRAP

Atlantic ports — Maximum shipping point prices, plus actual charge for transporting the scrap from shipping point to place of export. To these prices may be added actual costs incident to shipment for export.

Canadian and Mexican borders — Shipping point prices, plus actual charge for transporting from shipping point to place of export.

Gulf ports—Maximum price for No. 1 heavy melting is $15 a gross ton, f.a.s. point of export. For other grades, differentials as in Schedule A will apply. To this may be added actual costs incident to shipment for export.

RAILROAD SCRAP

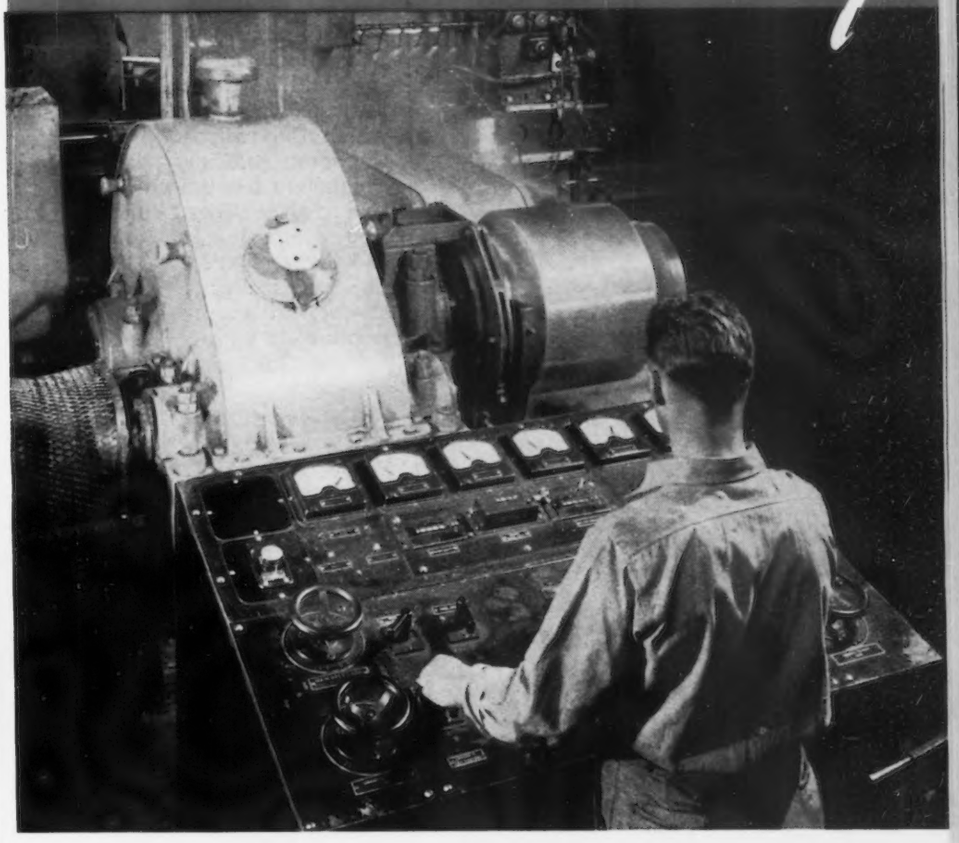
Atlantic ports — Maximum prices shall be those established for a consumer located on the road originating the scrap as listed in Schedule B, plus actual transportation costs to point of export. For material originating on a road not operating at a basing point, no transportation charges may be added to the maximum price as determined under Schedule B. To these prices may be added actual costs incident to shipment for export.

Canadian and Mexican borders — Same as for Atlantic ports, except omit sentence "to these prices may be added actual costs incident to shipment for export."

Gulf ports — Same as for Scrap Other Than Railroad, except that base price is $16 for No. 1 railroad heavy melting steel.

listed in Schedule B either of the following, whichever is less: (a) The average price per gross ton at which the railroad originator of the scrap sold any such grade to consumers located on and off the line of the railroad during the period commencing Sept. 1, 1940, and ending Jan. 31, 1941; *or* (b) The price at the basing point

Controlled Uniformity



Uniform Thomastrip Meets Your Needs and Saves Operations In Your Plant

SINCE Thomas Cold Rolled Strip Steel is precision made, its record of uniformity and dependability during forming and drawing operations is pre-eminent. It meets exacting specifications because each order is classified and double checked, first in the laboratory and then by the production department before mill operations start. The type of raw material, the procedure of rolling, and the method of annealing are selected to give the proper finish, edge, temper, and tolerance requirements. This steel is often electro coated by Thomas specialists and shows additional savings in factories through the elimination of plating operations.

Thomastrip — Cold Rolled Strip Steel

ALWAYS LABORATORY APPROVED

BRIGHT FINISH UNCOATED

AND ELECTRO COATED WITH

NICKEL, ZINC, COPPER, BRASS

THE THOMAS STEEL CO., Warren, Ohio

SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL

A 24 Hour
REVEILLE!
on
Springs, Wire Shapes, Snap-Clips, etc., for U. S. Industry

KEEP SPRINGS FLOWING to industry . . keep production on a continuous, unbroken schedule, 24 hours a day where necessary . . that's Cuyahoga's contribution to Uncle Sam's defense program and industry's production needs!

If you need springs, wire shapes or Snap-Clips as a vital part of your supply line, Cuyahoga has the production facilities, the precision and the craftsmen to serve you dependably.

THE CUYAHOGA SPRING CO
10280 BEREA ROAD
CLEVELAND, OHIO

nearest to the consumer's plant. For the grades not listed in Schedule B, either of the following, whichever is less: (a) The average price per gross ton at which the railroad originator of the scrap sold any such grade to consumers located on and off the line of the railroad during the period commencing Sept. 1, 1940, and ending Jan. 31, 1941; *or* (b) The average price per gross ton as determined in (a), minus the amount by which the average price of No. 1 railroad heavy melting steel scrap, as determined in (a), exceeds the price of No. 1 railroad heavy melting steel scrap at the basing point nearest the consumer's plant.

Please turn to page 116 for further details and price tables.

One-Price Policy Reaffirmed By South Bend Lathe Works

• • • **In full page advertisements** the South Bend Lathe Works is about to call attention of manufacturers to the fact that they need not and should not pay premium prices in order to get delivery of a South Bend lathe. All orders are being filled in accordance with the policies and regulations set up by OPM in Washington, the company points out, and the payment of a bonus cannot affect the delivery from the factory. No authorized dealer will ask more than the established price, regardless of delivery.

This unusual warning is being given, the company says, because certain machinery dealers have been buying up South Bend lathes wherever they can get them and reselling them at premium prices. Current prices are published in price list No. 49-A, dated Jan. 10, 1941, and are net to the purchaser f.o.b. South Bend, Ind.

Aluminum Strike Ended, Aircraft Workers Return

• • • **About 1100 Allison aircraft** employees returned to work last week after lay-offs due to shortage of aluminum caused by the strike at the Alcoa plant in Cleveland. Strike had curtailed daily shipments of aluminum to the aircraft engine plant here, and employees had to be sent home for lack of materials.

NO LEG: Industry's "surprise of the week" was Interior Secretary Harold Ickes charge before the Senate Defense Investigating Committee at Washington that the Aluminum Co. of America (which has expanded its capacity many times) had hampered the defense program by failing to produce enough aluminum. Industry saw that Mr. Ickes could find no evidence to support this unsupportable but headline-getting claim.

Outboard Motor Used To Agitate Oil in Quenching Tank

Cleveland

• • • **A recent trip in an** outboard motor boat gave a valuable idea to George H. Porter, general manager of George H. Porter Steel Treating Co. here. He adapted the outboard motor idea for agitating oil in a large quenching tank subjected to heavy usage.

Mr. Porter obtained a 1-hp. electric motor, a 16-in. propeller and the bottom half of a Chevrolet steering column, the latter giving him an enclosed shaft and the necessary angle. The device works fine.

Where will you be 5 years from today?

. . . Probably right where you are now, doing what you are doing now, but doing it better and faster, IF the new machinery you are ordering includes Axelson Lathes.

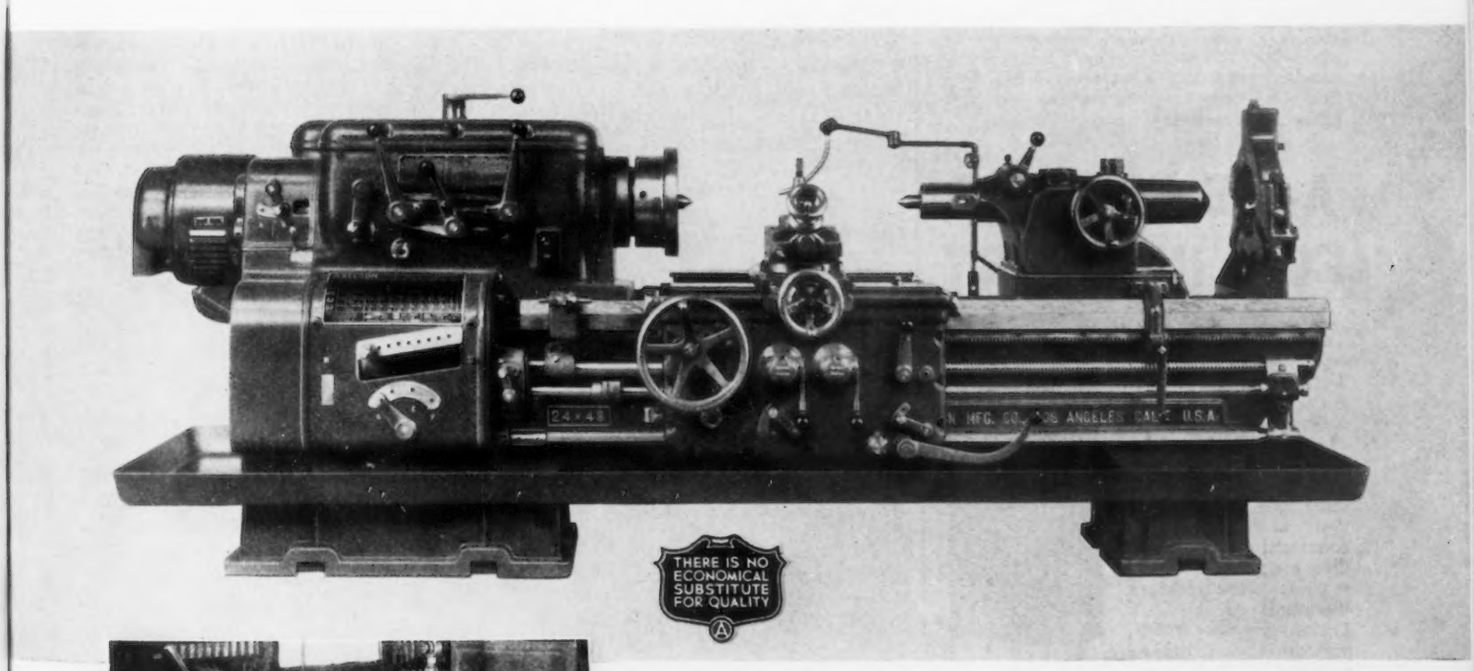
Now is the time for horse sense—not hysteria. Don't buy for this year alone but with the thought that the lathe you install today to machine munitions of war will ultimately be used for the tasks associated with peacetime manufacturing.

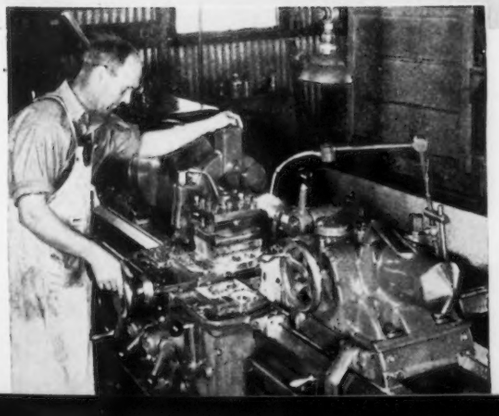
Axelson Lathes are designed right and they are built throughout of materials best adapted to the purpose. They are good today and we know that they'll still be doing a first-class job for their purchasers for many years to come. They afford a wide range of operating speeds and feeds necessary for fast production. They are accurate and they operate smoothly year after year with minimum power consumption.

Before you buy any lathe investigate Axelson

AXELSON MANUFACTURING COMPANY

6160 South Boyle Avenue, Los Angeles, California (P. O. Box 98, Vernon Station) • 50 Church Street, New York • 3844 Walsh Street, St. Louis





At the left an Axelson Lathe is shown turning a half-inch taper on the end of a piston rod. This job requires accuracy to .001 of an inch.

The lathe illustrated above is an Axelson 24". Axelson Heavy Duty Lathes are also available in 14", 16", 18", 20" and 32" sizes.

WRITE TODAY for your copies of the newest Axelson Lathe Folders. Latest views of the lathes together with complete descriptions and specifications are given.

THE PACE IS GETTING HOTTER!

. . . and many concerns are finding A-S-E Shop Equipment a real life-saver. With A-S-E Stacking Boxes and Stack-Units they are speeding up inter-departmental handling of small parts—breaking bottlenecks and conserving valuable storage space.

A-S-E Shop Boxes are designed for speed and efficient handling of small parts in production and assembly. Their steel construction makes them resistant to fire hazards — and they are able to stand up under hard use where ordinary boxes would break down. They can be stacked as high as desired without danger of telescoping or becoming unstacked by vibration. Parts are kept readily accessible.

Write today for the new, illustrated catalog. It shows how many concerns are obtaining adequate storage and efficient handling of small parts with A-S-E Shop Boxes. A copy is yours without any obligation. Write today.

A-S-E LOCKERS FOR INDUSTRY

You can meet your locker requirements with A-S-E Modern Lockers—there's a type for every need — box lockers, single- and double-tier. They embody correct design and sturdy strength, and eliminate the maintenance costs so frequently encountered with less sturdily constructed equipment. Hundreds of thousands of A-S-E Lockers are now in use, presenting conclusive evidence of their durability and satisfactory performance. Write for complete facts.

ALL-STEEL-EQUIP COMPANY, Inc.
708 JOHN STREET
AURORA • ILLINOIS

Forging, Aircraft Part Plants on DFC Lease List

• • • **The Defense Plant Corp.** has authorized execution of the following lease agreements:

Champion Machine & Forging Co., Cleveland, $2,699,680, for construction and equipment of plant at Cleveland for the manufacture of steel forgings for War Department. Equipment cost, $2,006,545.

Hughes Tool Co., Houston, Tex., $3,725,001, for construction and equipment of a plant to produce aircraft parts for War Department. Equipment cost, $2,873,426.

Walter Kidde & Co., Inc., Bloomfield, N. J., $2,242,323, for construction and equipment of a plant to manufacture naval aircraft equipment. Equipment cost, $1,252,323; also an additional $132,725 to expand present plant.

Ohio Crankshaft Co., Cleveland, an increase of $393,500 for purchase of additional machinery to manufacture crankshafts for Diesel and gas engines for the Navy.

N. A. Woodworth Co., Ferndale, Mich., increase of $237,400 for equipment and addition to building to manufacture aircraft parts for War Department.

Elastic Stop Nut Corp., Union, N. J., $608,736 for equipment for manufacture of airplane parts for War Department.

Britain's Ore Supplies Are Fairly Satisfactory

• • • **Most kinds** of foreign ore remain in satisfactory supply in Britain, but descriptions required for hematite-making are as difficult as ever to obtain. The exceptionally extensive use of domestic ironstone has greatly reduced dependence on import of foreign raw material.

In Lancashire County the Florence Mines are maintaining steady production and lumpy and annealing ores are also in keen demand, production having been maintained at the maximum capacity of the plant.

Large areas have been prospected at several places in Cumberland, and a large boring program is being conducted with a view to increasing the ore reserves.

Photo by Harris & Ewing

DRAFT MACHINE TOOLS?: Undersecretary of War Robert Patterson is pictured last week as he urged the Senate Military Affairs Committee to approve the War Department's "draft property" system for getting needed materials and machine tools. "We have not depended on the volunteer system to recruit our Army," he said "Are we to refuse to draft materials needed for the armed forces?"

New Car Registration at All-Time High in April

Detroit

• • • **New passenger car and** new truck registrations in April both established new all-time records for any single month in the history of the automobile industry, R. L. Polk & Co. reported. Only 11,000 units short of the half million mark, passenger car registrations totaled 489,074 units to surpass the previous high month of April, 1929, by 7399 units. New truck registrations totaled 70,269 units, up 2390 units over the previous high month of April, 1937. Registrations for the four month period total 1,508,777 in 1941 compared to 1,314,827 in 1929.

Meehanite Institute Meets Despite Bombs

Pittsburgh

• • • **Word has reached** the offices of the Meehanite Metal Corp. here that, despite bombs and "blitzes", the International Meehanite Research Institute held its annual meeting in London on June 16 and 17. Representatives from the 19 Meehanite foundries in Great Britain attended. Research papers were presented and distributed to member foundries.

Non-Strikers Get $25,000

New Castle, Ind.

• • • **Richer by $25,000** are 233 non-striking employees of the Ingersoll Steel & Disc division of Borg-Warner Corp. Thrown out of work in an eight weeks' strike a year ago, the employees petitioned the circuit court for unemployment compensation, saying they had wanted to work and not strike.

10 New Shops To Train Ohio Metal Workers

Cleveland

• • • **Ten new shops to train 3000 men and women in metalworking for Ohio defense industries are planned by the Ohio Division of N.Y.A., according to an announcement by L. B. Jacobs, state N.Y.A. administrator.**

New shops which will cost $75,000 each to construct and equip, will be built of prefabricated metal. Each will operate with 100 workers and three shifts of trainees will keep the shops running day and night. Courses will be offered in machine shop, welding, forge shop practice and sheet metal work. Articles produced for local and state governmental agencies will be a by-product of the training program.

Announcement of the location of the new plants is expected soon. Two N.Y.A. shops already are in operation at Hamilton and Steubenville.

Army To Build 14 Warehouses in Illinois

Savanna, Ill.

• • • **Bids will be asked** soon for construction of 14 warehouses at the Army Ordnance depot here. Warehouses and incidental construction will total about $1,800,000 which has been allocated by the War Department.

J. & L. Expands Wire Rope Plant

Pittsburgh

• • • **Jones & Laughlin Steel Corp.** has begun work on an extension to its wire rope plant at Muncy, Pa., and the installation of additional equipment.

The addition, 120 x 275 ft., will house a new closing machine which fabricates a strand into finished rope. Additional warehouse will also be provided by the new addition. A new office building is also being constructed. The present plant was completed in June, 1938.

BRONZES
MONEL METAL
ALLOY IRON
NI-RESIST

•

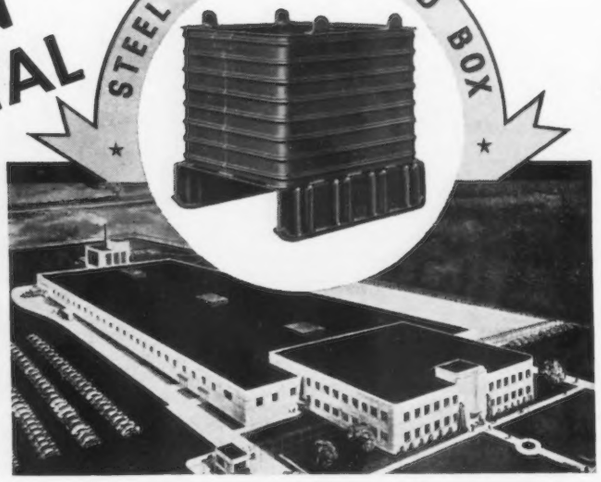
Pump Liners
Cylinder Liners
Rolls and Roll Covers
Propeller Shaft Sleeves
Stern Tube Bushings
Sleeves
Plungers
Pipe-Tubes
Bushings
Bearings
Drums
Castings
Special Work

•

"SHENANGO-PENN"
SHENANGO-PENN MOLD COMPANY
PITTSBURGH, PA. PLANT: DOVER, OHIO

UNION METAL

STEEL TIERING SKID BOX



Helps Conserve Time and Space At New Bendix-Westinghouse Plant

★ There's no waste space in this modern plant of the Bendix-Westinghouse Automotive Air Brake Company at Elyria, Ohio. Even the free air areas are fully utilized for material storage through the use of 3000 Union Metal Tiering Skid Boxes.

One of these all-welded steel boxes is illustrated above. Union Metal's exclusive double corrugated construction assures greater strength and durability throughout. Platform is equipped with protective floor runners, and lugs on top of box permit tiering to any reasonable height.

Unit can be handled speedily by hand lift truck or power truck, making it equally efficient for short spottings and long hauls, as well as tiering.

If you have a materials handling problem, consult Union Metal. You'll find the solution in their complete and modern line of steel boxes, skid platforms and pallets. Write for catalog and name of nearest sales office.

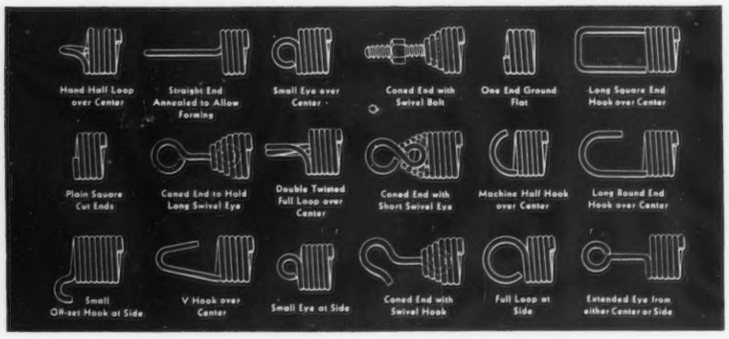
UNION METAL

THE UNION METAL MANUFACTURING CO.
CANTON, OHIO

the practical side of Springmaking — BY DUNBAR

There's an end to everything even a SPRING —

and for extension springs here are the various possibilities:


Hand Half Loop over Center
Straight End Annealed to Allow Forming
Small Eye over Center
Coned End with Swivel Bolt
One End Ground Flat
Long Square End Hook over Center
Plain Square Cut Ends
Coned End to Hold Long Swivel Eye
Double Twisted Full Loop over Center
Coned End with Short Swivel Eye
Machine Half Hook over Center
Long Round End Hook over Center
Small Off-set Hook at Side
V Hook over Center
Small Eye at Side
Coned End with Swivel Hook
Full Loop at Side
Extended Eye from either Center or Side

Make sure you get the right spring with the best loop or hook.
It pays!

Dunbar Bros. Co.

DIVISION OF ASSOCIATED SPRING CORPORATION
BRISTOL, CONNECTICUT
"Quality Springs since 1845"

Government Awards . . .

War Dept., Ordnance:

American Car & Foundry Co., Berwick, Pa.; idlers	$6,875
American Cutter & Engineering Co., Detroit; punches, head	2,160
Autocar Co., Ardmore, Pa.; spare parts	1,799,070
Baird Machine Co., Bridgeport, Conn.; tools and machinery	5,646
Barker Tool Die & Gage Co., Detroit; gages	21,080
Bethlehem Steel Co., Bethlehem, Pa.; forgings, breech rings	44,950
E. W. Bliss Co., Brooklyn; presses, vertical	9,136
Bridge Tool & Die Works, Philadelphia; plates, carrier	4,920
Brown & Sharpe Mfg. Co., Providence; machines, milling	23,194
Buckeye Traction Ditcher Co., Finley, Ohio; parts for tractors	17,807
Buda Co., Harvey, Ill.; parts for tanks	58,020
Cincinnati Milling Machine Co., Cincinnati; grinders, cutters and tools	3,436
grinders	2,441
Continental Motors Corp., Detroit; engines, radial	101,881
Dempster Brothers, Inc., Knoxville, Tenn.; hoisting units with detachable buckets	4,709
Electro Dynamic Works, Bayonne, N. J.; electric motors and starting equipment	15,234
Firestone Steel Products Co., Akron, Ohio; links, metallic	10,293,675
Firestone Tire & Rubber Co., Noblesville, Ind.; assemblies, track	541,800
Fischer Spring Co., Brooklyn; extractors, rifle	142,000
Gilbert & Barker Mfg. Co., West Springfield, Mass.; screws, thumb	2,334
Great Lakes Steel Corp., Ecorse, Detroit; steel plate	4,229
Illinois Gage Co., Chicago; gages	3,842
International Engineering Works, Framingham, Mass.; stampings, steel plate	14,348
steel punchings	4,055
J. F. Johnson & Co., Philadelphia; punches	7,115
Jones & Lamson Machine Co., Springfield, Vt.; cams	6,854
Kent Aircraft & Machine Tool Co., Camden, N. J.; gages	13,434
H. R. Krueger & Co., Detroit; machines, chambering	87,800
LaPointe Machine Tool Co., Hudson, Mass.; machines, broaching	35,973
Lindberg Engineering Co., Chicago; furnaces	13,640
Lukens Steel Co., By-Products Steel Corp. Division, Coatesville, Pa.; parts for top carriage on gun mounts and steel stampings	58,073
Mack Mfg. Corp., New Brunswick, N. J.; parts for transmissions and final drive units	708,677
Metal & Thermit Corp., New York; electrodes, welding	11,200
Midvale Co., Nicetown, Philadelphia; forgings	835,172
forgings, tube	3,776
Morton Mfg. Co., Muskegon Heights, Mich.; machines, milling	83,500
National Cash Register Co., Dayton, Ohio; fuze	268,180
Otis Steel Co., Cleveland; steel	11,254
Reliable Tool Co., Irvington, N. J.; tools	31,375
Remington Arms Co., Inc., Bridgeport; cartridges	349,432
Vickers, Inc., Waterbury Tool Division, Waterbury, Conn.; parts for speed gears	3,004
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.; machines, vertical, bullet assembly and gaging and weighing	45,200
Wiedemann Machine Co., Philadelphia; gages	21,607

AWARDS

Worthington Pump & Machinery Corp., Holyoke, Mass.; compressors, air 8,316
Wollaston Brass & Aluminum Foundry, North Quincy, Mass.; castings, bronze 3,712

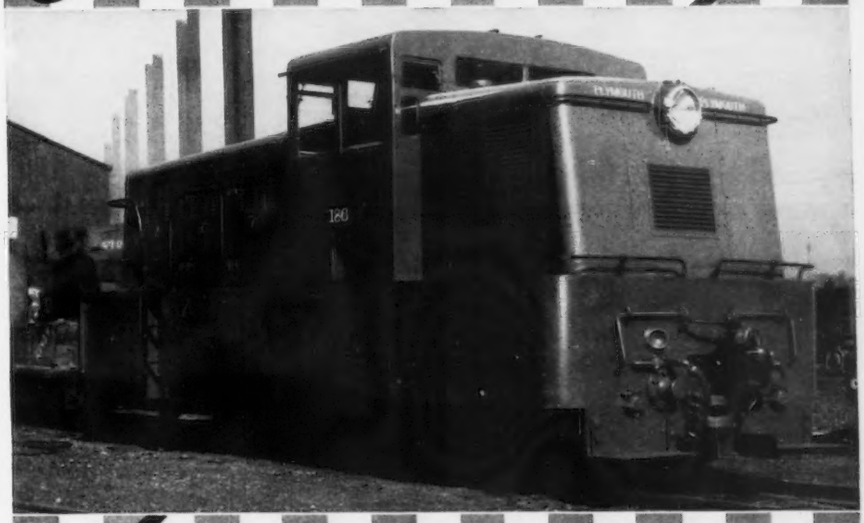
War Dept., Air Corps:

Aro Equipment Corp., Bryan, Ohio; pump assemblies $1,135,700
Clarence Avildson, trading as Republic Drill & Tool Co., Chicago; drills, twist 299,942
Bell Aircraft Corp., Buffalo; adapters, gun mount 35,625
Bendix Aviation Corp., Bendix Products Division, South Bend, Ind.; cylinders and valves, hydraulic gun charging 179,250
Bendix Aviation Corp., Eclipse Aviation Division, Bendix, N. J.; starter and switch assys. 182,419
Bendix Aviation Corp., Pioneer Instrument Division, Bendix, N. J.; compass assys. 37,200
Boeing Aircraft Co., Seattle; maintenance parts for airplanes ... 1,628,999
Buffalo-Springfield Roller Co., Springfield, Ohio; rollers, road. 216,524
Caterpillar Tractor Co., Peoria, Ill.; tractors 50,410
Cleveland Pneumatic Tool Co., Cleveland; strut assemblies 2,621,018
Curtiss-Wright Corp., Airplane Division, Buffalo, N. Y.; maintenance arts for airplanes 843,604
Denison Engineering Co., Columbus, Ohio; testers, spark plug.. 137,519
Fruehauf Trailer Co., Detroit; semi-trailers 150,662
Lite Mfg. Co., New York; target assys. 98,580
Glenn L. Martin Co., Baltimore; airplanes and spare parts 73,764,450
Reynolds Metals Co., Louisville, Ky.; aluminum alloy 292,856
Seifreat-Elstad Machinery Co., Dayton, Ohio; tinners equipment .. 54,412
Square D Co., Kollsman Instrument Division, Elmhurst, N. Y.; altimeter assys. 113,700
Standard Pressed Steel Co., Jenkintown, Pa.; work benches ... 50,267
Titeflex Metal Hose Co., Newark; manifold and lead assys. 84,270
Wright Aeronautical Corp., Paterson, N. J.; engines and spare parts 7,977,503

War Dept., Other Agencies:

Addressograph-Multigraph Corp., Cleveland; imprinting machines $63,100
American Car & Foundry Co., New York; railroad cars 223,750
American Locomotive Co., Schenectady; locomotives 286,750
American Sterilizer Co., Erie, Pa.; operating tables 20,512
W. Ames & Co., Jersey City, N. J.; galvanized bolts, washers and spikes 3,652
Anaconda Wire & Cable Co., Marion, Ind.; wire 532,000
Josiah Anstice & Co., Inc., Rochester, N. Y.; French fry cutters 5,201
E. J. Bartells Co., Seattle; pipe and fittings 9,475
Bethlehem Steel Co., Bethlehem; structural steel 118,080
J. Bishop & Co. Platinum Works, Malvern, Pa.; surgical equipment 6,946
Charles Bruning Co., Inc., Chicago; printing equipment 4,736
Buck X-Ograph Co., St. Louis; X-Ray field units 38,500
A. L. Cahn & Sons, Inc., New York; mess items 4,941
Caterpiller Tractor Co., New York; tractors 8,195
Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati; milling machines 7,023
Cleveland Twist Drill Co., Cleveland; drills, detonating cord ... 7,743
Columbia Equipment Co., Aurora, Ill.; miscellaneous machinery .. 6,642

TO KEEP PRODUCTION *On the Move*



Flexomotives are FIRST IN FLEXIBILITY • POWER ECONOMY • AVAILABILITY EFFICIENCY • RUGGEDNESS

To meet today's production challenge, raw materials, work in process and finished goods must be kept on the move . . . in volume tonnage. That's a job for track haulage with industrial locomotives. And here . . . as in every other step . . . only peak efficiency can satisfy present day requirements. There's no room today for "second best" performance.

When you choose a Plymouth Flexomotive you get the No. 1 performer in the locomotive industry. Test after test on all kinds of jobs have *proved* that "Flexomotives are First." Here's the record—

. . . outstanding flexibility to fit a variety of work and conditions. One-man operation. Instant finger-tip control.
. . . outpulls any other diesel of equal size, horsepower. A 45-ton Flexomotive outpulled 65-ton steamer on same job.
. . . 20% less fuel—plus lowest maintenance cost ever recorded for a full-powered locomotive.
. . . 95 to 97% availability in continuous service.
. . . 83 to 88% efficiency.
. . . most ruggedly built internal combustion locomotive in America. That's the kind of performance you need today. Get a Flexomotive!

WRITE FOR PROOF!
Facts and figures for 35,000 hours of continuous operation prove that "Flexomotives are First." Write today for free bulletins.

PLYMOUTH LOCOMOTIVE WORKS
Division of The Fate-Root-Heath Co.
PLYMOUTH, OHIO, U.S.A.

PLYMOUTH *Flexomotive*
DOLLAR FOR DOLLAR . . . THE GREATEST LOCOMOTIVE EVER BUILT

Columbia Equipment Co., Seattle; wire rope 8,202
Couse Laboratories, Inc., Newark; mobile repair shop bodies 25,000
Crane Co., Seattle; pipe and fittings 4,227
Davenport Besler Corp., Davenport, Iowa; locomotives 421,425
Eugene Dietzgen Co., Inc., Chicago; transits, engineer's 108,267
Doermann - Roehrer Co., Youngstown, Ohio; black pipe 3,424
Electric Hotpack Co., Inc., Philadelphia; tray service trucks ... 10,000
Eureka Vacuum Cleaner Co., Detroit; eyerings, brass 34,700
Fate-Root Heath Co., Plymouth, Ohio; locomotives 31,358
Federal Tin Co., Inc., Baltimore; tinplate 3,115
General American Transportation Corp., Chicago; cars, tank, railroad 9,068
General Electric Co., Schenectady; locomotives 197,400
General Electric Supply Corp., Washington; cables and cable terminals 8,062

TRADE **AUTOMATIC** MARK

Manufacturers for Over Thirty Years

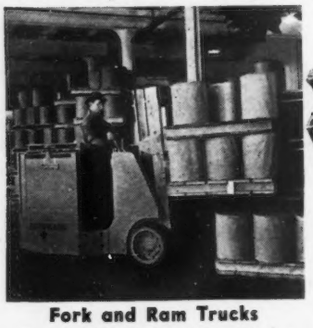
MODERN
Electric Propelled **INDUSTRIAL TRUCKS**

FOR ECONOMICAL MATERIALS HANDLING

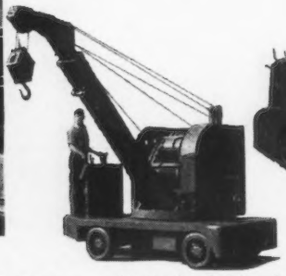
- FORK AND RAM TRUCKS
- LOW AND HIGH LIFT TRUCKS
- COIL AND SHEET HANDLERS
- LOAD CARRIERS
- TRACTORS — CRANES

Capacities 1000 to 60,000 lbs.

Low Lift Skid Platform Type



Fork and Ram Trucks
Telescopic and Non-Telescopic for Pallet and Coil Handling

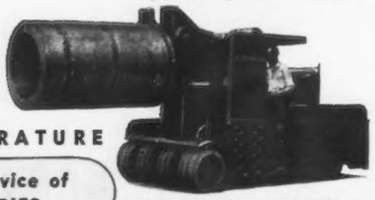


Cranes — Motorized Slewing Type—*Four Motor Control for Individual and Simultaneous Operation*

High Lift Skid Platform Type

Light Duty Fork Trucks

Die Handlers Heavy Duty Type
with motorized die and unloading platform



Coil and Sheet Handlers

REQUEST DETAILS AND LITERATURE

Listed Under Reexamination Service of UNDERWRITERS' LABORATORIES

AUTOMATIC TRANSPORTATION CO.
75 W. 87th St. Div. of the Yale & Towne Mfg. Co. CHICAGO, ILL.

Harris Seybold Potter Co., Cleveland; press litho, rotary 4,040
Hobart Mfg. Co., Troy, Ohio; electric food choppers and mixers .. 22,188
Hospital Supply Co. & Watters Laboratories, Consolidated, New York; sterilizers 87,384
Imperial Machine & Foundry Corp., Lindenhurst, N. Y.; vegetable peelers 22,918
Independent Concrete Pipe Corp., Inc., St. Louis; pipe and fittings 7,027
Ingersoll-Rand Co., Painted Post, N. Y.; air compressors 7,924
K.D. Lamp Co., Cincinnati; reflectors 9,000
Landers, Frary & Clark, New Britain, Conn.; hot plates 5,983
A. Leschen & Sons Rope Co., Seattle; wire rope 3,114
Maclane Hardware Co., New York; hospital and field equipment ... 5,936
Markham Products Co., Birmingham, Ala.; shores and jacks ... 19,375
National Stamping Co., Detroit; angle tubes, diaphragm 30,500
Northern Commercial Co., Minneapolis; crusher and elevator units 7,062
Okonite Co., Passaic, N. J.; cable, lighting and power 2,327
wire 664,700
Paving Supply & Equipment Co., Washington; shovels, gasoline engine driven 11,750
Pelton & Crane Co., Detroit; instrument sterilizers 64,350
Pittman Auto Co., Brownsville, Tenn.; hydraulic dump trucks.. 3,983
John A. Roebling's Sons Co. of C. if., Seattle; wire rope 3,765
Scanlon-Morris Co., Madison, Wis.; combination sterilizing outfit .. 153,750
operating tables 23,852
Seattle Steel Co., Inc., Seattle; structural steel 4,792
Service Industries, Inc., Chicago; mess equipment 156,642
South Chester Tube Co., Chester, Pa.; pipe, drive 8,518
Standard Scientific Supply Corp., New York; laboratory equipment and supplies 10,553
Sullivan Machinery Co., New York; pile driver attachments, paving breakers, clay diggers, rock drills, air hose 16,551
machines, wood boring 3,213
United Carr Fastener Corp., Cambridge, Mass.; clinch plates, sockets, studs, washers and clips 56,399
United States Rubber Co., Bristol, R. I.; wire 3,143,250
Washburn Co., Worcester, Mass.; clamps and loops for gas mask assys. 4,014
Western Machine Tool Works, Holland, Mich.; radial drills ... 9,476

Defense Plant Building:

Alabama Ordnance Works, Sylacauga, Ala.; construction, machinery and equipment plant addition for mfg. TNT, DNT and tetryl $24,675,000
Anhydrous ammonia plant, Louisiana, Mo.; plant for mfg. ammonia to supply to propellent powder and high explosive plants 16,750,000
Anhydrous ammonia plant, Monroe, La.; plant for mfg. ammonia to supply to propellent powder and high explosive plants 16,750,000
Maumelle Ordnance Works, Marche, Ark.; picric acid plant 16,750,000

SWOC Puts Checkoff Up to Defense Board

Pittsburgh

• • • **SWOC has signed a new contract with the Wheeling Steel Corp., on behalf of its members, under which the 10c. an hr. wage increase made effective April 1 was made part of the agreement.**

A unique turn in the negotiations between SWOC and Wheeling centered on the demand for a union shop and checkoff system, when the SWOC elected to submit these issues to the National Defense Mediation Board for its determination after being turned down by the company. The decision of the board will be incorporated into the contract, according to the union. The outcome of this request to the National Defense Mediation Board will be awaited with considerable interest, as it may determine a precedent in subsequent cases of this type.

According to the union, the SWOC was granted the right to jointly work out an apprenticeship training program and the decision was devised and agreed to by management, whereby sub-committees for fact finding purposes will be established.

One week's vacation with pay for all employees having one year or more service is provided but management reserves the right to give vacation pay in lieu of time off in case such vacation schedules should interfere with the national defense program.

Under the contract, the present practice of two pay days a month was changed to three a month.

$2.7 Million Expansion For Champion Machine & Forging

• • • **Champion Machine & Forging Co.** here, which makes steel forgings for airplane landing gear struts and motor crank cases and forgings for crankshafts and connecting rods for diesel engines, has embarked on a $2,699,680 government-financed expansion program.

Machinery and equipment for the addition will cost $2,006,545. The forge shop will have about eight steam hammers with drop pressures ranging from 6 tons to more than 17 tons. There will also be six blacksmith steam hammers.

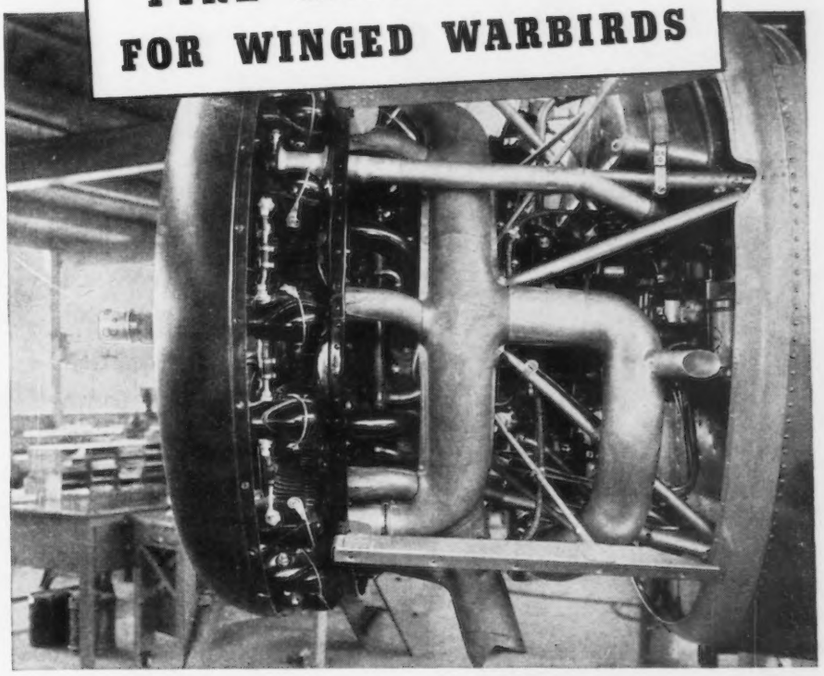
Army Orders 12,000 Trucks, 1600 Tanks From Chrysler

Detroit

• • • **The Chrysler Corp.'s orders** for tanks have been nearly tripled, with the addition of 1600 M-3 tanks placed last week, bringing total orders to 2600 units worth $90,500,000. The schedule calls for five tanks per 8-hr. day by late summer. Equipment is now being installed in a $20,000,0000 plant, and a working force trained.

The corporation's Dodge Division has received a new $11,000,000 order from the Army for 12,000 four wheel drive, half ton trucks, including weapon carriers, command cars, radio cars, ambulances and carry-alls. More than 40,000 of the 73,000 trucks which the Army has ordered from Dodge in the past 12 months have been delivered. Production is at the rate of more than 250 a day.

FIRE-EATING GUTS FOR WINGED WARBIRDS



Eating tongues of fire as hot as 1700°F. is no job for weak-stomached metals. That is what exhaust systems in Uncle Sam's new superpowered, high-speed warplanes do. And that is why aircraft designers rely on heat-resisting ARMCO Stainless Steels for these torturing tasks.

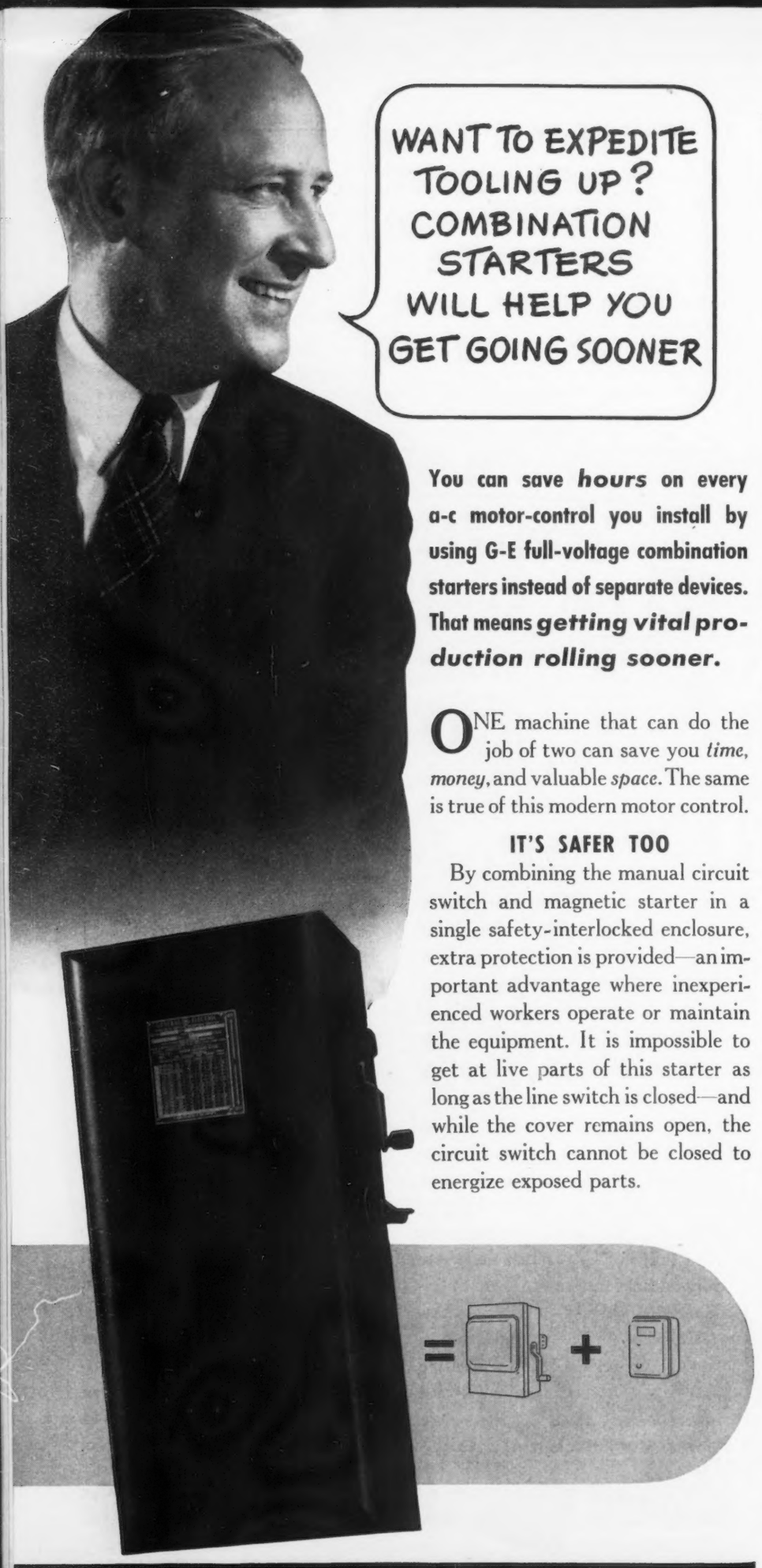
In exhaust systems these tough rustless metals resist hot, corrosive gases, cut maintenance costs and assure longer airworthy life.

Designers also specify ARMCO Stainless for fire walls, nacelles, tanks, floats, hulls, wing faring, ailerons, flare cans and ammunition-handling equipment. Light, though strong and rigid, ARMCO Stainless Steels form readily and are easily fabricated by the fast, economical spot-weld process.

Write for specific information on ARMCO Stainless Steels for aircraft applications. The American Rolling Mill Company, 2141 Curtis Street, Middletown, Ohio.

ARMCO

STAINLESS STEELS



You can save *hours* on every a-c motor-control you install by using G-E full-voltage combination starters instead of separate devices. That means *getting vital production rolling sooner.*

ONE machine that can do the job of two can save you *time*, *money*, and valuable *space*. The same is true of this modern motor control.

IT'S SAFER TOO

By combining the manual circuit switch and magnetic starter in a single safety-interlocked enclosure, extra protection is provided—an important advantage where inexperienced workers operate or maintain the equipment. It is impossible to get at live parts of this starter as long as the line switch is closed—and while the cover remains open, the circuit switch cannot be closed to energize exposed parts.

GENERAL ELECTRIC

Steel Plants On Coast To Expand

Washington

• • • **The proposals by existing** companies to expand steel ingot capacity in the Far West by 1,556,000 tons at a cost of approximately $100,000,000, announced last Friday by the OPM, is a part of the 10,000,000-ton nation-wide expansion that now is under consideration. A portion of the added western capacity, however, had been decided upon before the larger program was being officially studied.

Of the increased ingot capacity in the West, the Columbia Steel Co., a United States Steel Corp. subsidiary, will add 930,000 tons capacity, the Bethlehem Steel Co. 276,000 tons, the Colorado Fuel & Iron Co., Pueblo, Colo., 250,000 tons and the Pacific State Steel Co. Niles, Cal., 100,000 tons.

Negotiations involving emergency plant facility contracts with the Navy Department are also under way to expand heavy forging facilities on the west coast at the plants of the Isaacson Iron Works, Seattle, Wash.; the American Forge Co., Oakland, Cal.; the Moore Dry Dock Co., Oakland, and the National Supply Co., Los Angeles. The Pacific Car & Foundry Co., Seattle, has also submitted alternate proposals to build a new steel foundry at cost estimates up to $650,000 to meet defense requirements of the Navy and Maritime Commission and other essential projects in that area.

The Columbia Steel Co. plan calls for new coke oven, blast furnace and rolling mill capacity. The total cost of the program is estimated at $63,200,000 of which the company proposed to finance approximately 10 per cent, asking government financing of the remainder. This estimate of cost does not include outlays for additional housing, or investment by railroads and power companies in additional facilities and equipment. Expansion would be made at the company's three western plants, Provo (Ironton), Utah; Torrence and Pittsburg, Cal.

The largest expansion, estimated at $57,200,000 would be at the Provo plant where the com-

pany now has only a blast furnace. The new units would include additional coke ovens, blast furnace, open hearth plant, bloom and slab mill, sheet bar mill, jobbing and sheet mill, plate mills and a steel foundry.

At Torrence it is proposed to expand the present steelworks and rolling mills at an estimated cost of $1,750,000. At Pittsburg the plan calls for additional open hearth furnaces, a blooming, billet and merchant mill at an estimated cost of $4,250,000.

Government financing of the entire estimated cost of $12,000,000 was requested by the Bethlehem company for expansion at its Los Angeles, South San Francisco (Cal.) and Seattle plants as follows:

Los Angeles: Additional open hearth furnaces, electric furnace soaking pits, blooming mill, billet mill, combination bar and structural mill and billet preparation and alloy finishing facilities. Estimated cost, $10,000,000.

South San Francisco: Additional open hearth furnace, reheating furnace at structural mill and extension to structural storage and shipping building and facilities. Estimated cost, $900,000.

Seattle: Additional open hearth furnace, reheating furnace at structural mill and extension to structural storage and shipping building and facilities. Estimated cost, $1,100,000.

The Pacific State Steel Co. is expanding its facilities and will increase its capacity for alloy ingots for heavy forgings and other defense uses for which financing is provided through an emergency plant facility contract with the Navy Department. The estimated cost of this expansion is $700,000.

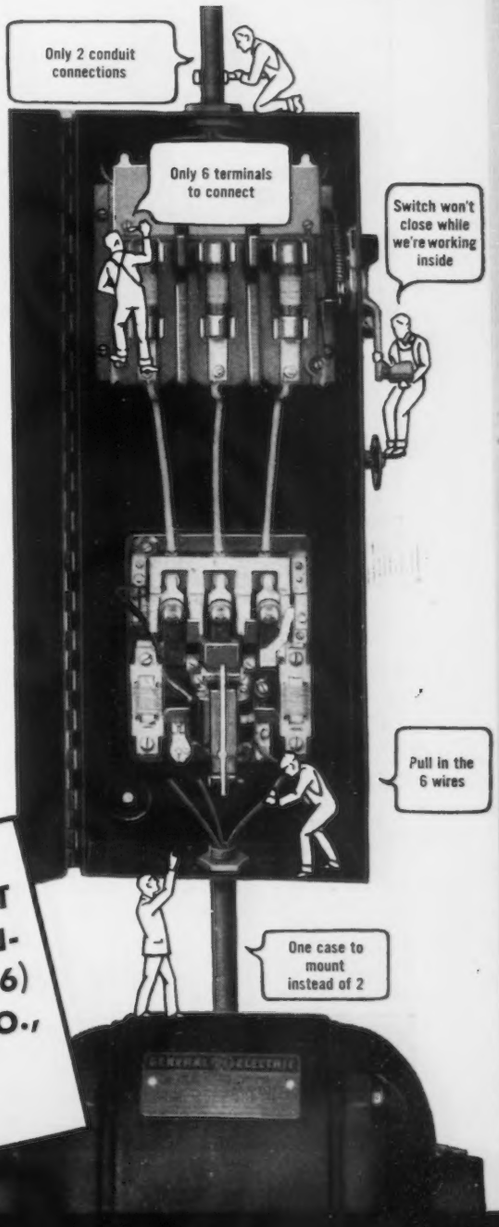
The Colorado Fuel & Iron Corp. program includes additional coke ovens, blast furnace, open hearth furnaces and increases in finishing facilities. Its estimated cost is $15,000,000.

All of the proposals contemplate expanding facilities at established coal and iron ore mines and steel plants. They are generally in line with recommendations made recently by W. A. Hauck, Steel Consultant for OPM, in a report on the west coast steel supply. In that report he advocated a minimum, 1,115,200-ton expansion of steel capacity on the

Combination starters are taken out and re-installed more quickly than separate devices. That's why they multiply savings on changeover.

AUTOMOTIVE manufacturers have long recognized that the right control for them is the control that has everything in one "package." That's because, with mass-production methods, they periodically change over their equipment to re-adapt it to changing demands. It's especially during this changeover period that savings are made—you make the original installation savings all over again each time the motor, or control, or machine is relocated.

Do as the leading automotive manufacturers do—use G-E combination starters for your new plant equipment. Your G-E agent or the nearest G-E office can give you full information.


Only 2 conduit connections
Only 6 terminals to connect
Switch won't close while we're working inside
Pull in the 6 wires
One case to mount instead of 2

SEND FOR "HOW TO GET MORE FOR YOUR CONTROL DOLLAR" (GES2456) GENERAL ELECTRIC CO., SCHENECTADY, N. Y.

GENERAL ELECTRIC

coast for strategic reasons and to meet increasing western needs, recommending expansion of existing facilities as the way to increase production most rapidly and with the least installation cost.

The OPM together with the various government departments and agencies concerned are now considering the expansion proposals.

Government to Pay For Steel Program

Pittsburgh

• • • **The announcement by OPM** regarding steel expansion proposals to the West Coast, disclosed a definite clue as to the probable course of financial arrangements in case the government's requested steel expansion program goes through, according to steel circles here.

The Columbia Steel Co., subsidiary of U. S. Steel Corp., in submitting its proposal for expansion in accordance with the OPM request, proposed to finance approximately 10 per cent of the project, the government to finance the balance. In the case of Bethlehem Steel Co., government financing was requested for the entire cost.

Inasmuch as the 10,000,000 ton expansion program is a specific request of the government and was not initiated by the steel industry which continues to believe that present facilities are adequate for national defense, it is fairly certain that other steel companies' proposals will bear a recommendation that the majority of any expansion programs should be built at government expense.

After OPM has studied the various proposals on its recom-

KOPPEL INDUSTRIAL CARS

There are over 75 types of Koppel Cars—one of these will do your job better and cheaper, no matter what material you are moving, or how you are moving it.

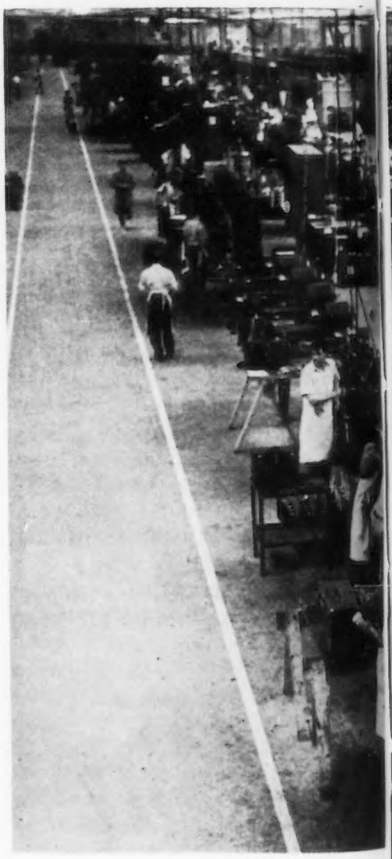
Koppel Cars are strong and durable—built to give years of long, dependable service under the toughest conditions.

Bulletin No. 71 gives concise information on modern haulage, with a quick description of the many types of Koppel Cars. Would you like this informative bulletin for your files?

KOPPEL

PRESSED STEEL CAR COMPANY, INC.
(KOPPEL DIVISION)
PITTSBURGH, PA.

APPLES TO AIRPLANES: U. S. industry is being forced by the national defense program into the interior and great new industrial centers are being set up. Just



mended steel making increase, the steel companies involved will carry out any requests made upon them. Action is expected within the next 30 to 40 days and it is believed that present facilities will be exploited, both from a mechanical and economical standpoint as much as possible. An expansion program, however, will definitely necessitate new blast furnace capacity, additional coke making facilities, increased mining operations, and in many instances increased shipping space for iron ore.

While the U. S. Steel Corp. has made no official announcement on its proposal to the OPM, it is understood that it contains a substantial program for Homestead, Edgar Thomson, and Duquesne works of Carnegie-Illinois Steel Corp. here. How far this proposal will go depends upon the decision to be reached by the OPM in the near future.

Plate Mill Projects Studied Total 21

Cleveland

• • • **The steel industry has** been formulating its plans speedily to step up output in line with Washington's desire for more capacity.

Twenty-one plate mill projects are being figured by the two principal makers of heavy rolling equipment. Some of these 21 projects merely involve changes at existing mills.

Many of the nation's principal high-speed strip mills will require changes in order to roll more plates. Expansion of the big Republic continuous mill here was announced about 10 days ago. The other high speed unit operated by Otis Steel Co. here has been asked

completed (begun 8 months ago), this new Wright Aeronautical Corp. airplane engine plant occupies onetime farm land near Cincinnati, Ohio.

Photo by Wide World

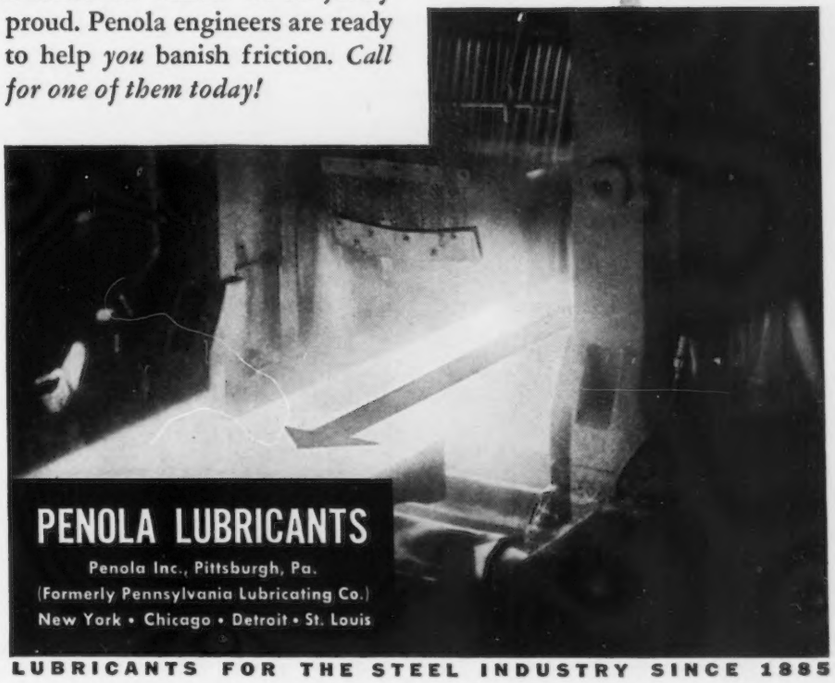
TODAY mills must produce at top speed—with no time out to repair friction damage! For STEEL is the back-bone of the whole Defense Program.

Fewer passes and deeper drafts, necessary for top-speed steel production, put a *terrific* heat and pressure load on $10,000 roll-neck bearings. And to forestall costly metal-to-metal contact, most of America's continuous hot strip and four-high mills depend on the same Penola lubricants that have seen them through for years.

Penola supplies more friction-fighting lubricants for the steel industry than any other company in the world. That's a vote of confidence of which we're justly proud. Penola engineers are ready to help *you* banish friction. *Call for one of them today!*

FOR RAPID-FIRE PRODUCTION

Steel picks PENOLA!



PENOLA LUBRICANTS

Penola Inc., Pittsburgh, Pa.
(Formerly Pennsylvania Lubricating Co.)
New York • Chicago • Detroit • St. Louis

LUBRICANTS FOR THE STEEL INDUSTRY SINCE 1885

to curtail sheet and strip production and roll more plates. Otis last week was studying changes which it may make. Otis also is contemplating more ingot production facilities.

Republic Steel Corp. has announced the purchase of two new 50-ton electric furnaces which will be installed at Canton. Around 122,000 tons additional annual electric furnace output will thus be provided, increasing the corporation's capacity of electric furnace alloy steel to 727,000 tons annually as compared to only 146,000 tons at the beginning of 1940. During 1940 Republic installed six 50-ton electric furnaces to meet the constantly increasing demand for this special type steel which is vital in the manufacture of light armor plate and airplanes. Delivery of the new furnaces is expected about Oct. 15.

It is understood Youngstown Sheet & Tube Co. has quite an extensive improvement program under consideration which, through rearrangement of existing facilities plus a few additions will greatly step up the company's output.

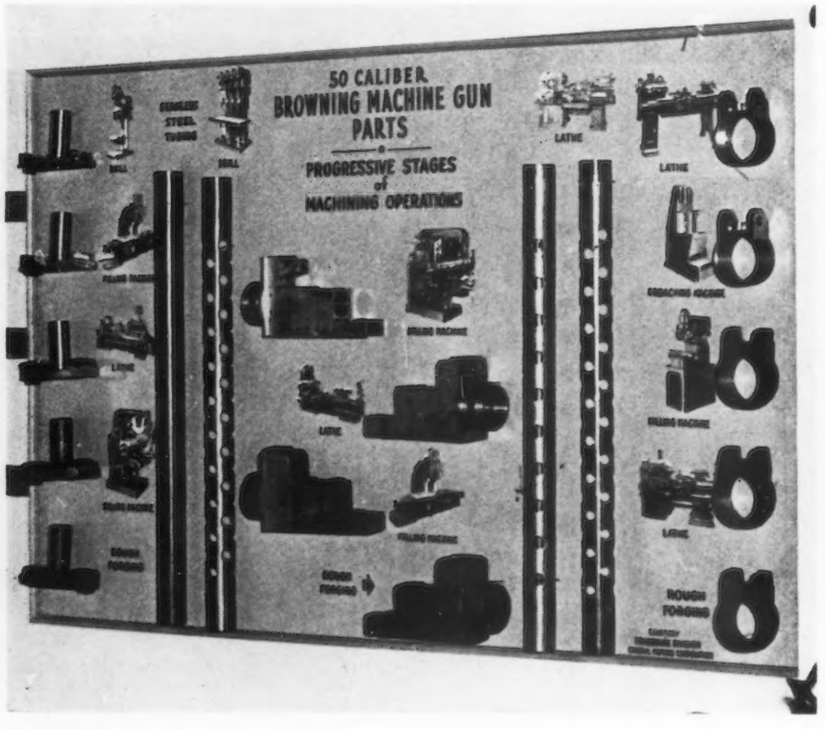
Alan Wood Steel Co., Otis Steel Co. and Lukens Steel Co. are figuring on extensive improvements.

Under the drive to obtain 10,000,000 more tons of ingot capacity Duluth looms as an important center of expansion. The American Steel & Wire Co. plant there probably will be put in shape to produce more ingots.

Some of the principal plants in the Pittsburgh, Youngstown, Cleveland territories, as well as a few in other locations, would like to add to their open hearth facilities but lack the space for expansion, as they are built close to rivers and the open hearths are flanked by mill buildings which will make it physically impossible to expand.

The South and far West undoubtedly will come in for important additions to steel production facilities. Carnegie-Illinois Steel Corp. is contemplating moving several blast furnaces to new locations. If the plan goes through, among the stacks reported likely to be moved are two at Joliet, Ill., and one at the Edgar Thomson Works near Pittsburgh.

GROWTH OF A BROWNING: Progressive stages in the machining operations of parts for a 0.50-cal. Browning machine gun were illustrated in this wall exhibit at the recent Miami Valley Industry and Defense Exposition, at Cincinnati. The central piece of the machine tool display was in the form of a huge liberty bell with five panels containing photographic blowups of milling, grinding, planing, turning and drilling operations. Cincinnati Milling Machine Co. worked out the display with the R. K. Le Blond Machine Tool Co. and an advertising agency.



Steel & Wire to Build Rod, Merchant Mills

Cleveland

• • • **American Steel & Wire** Co. will build a new coarse rod mill and a new mill for the manufacture of merchant products at the Collins Street plant in Joliet, Ill., which will replace the present facilities at the Rockdale and Scott Street plants in Joliet.

The new rod mill at Joliet eventually will replace the existing Waukegan rod mills. Billet storage and shipping facilities will be enlarged. Rod production thus will be increased somewhat by the installation. Wire drawing capacity at Joliet will not be greatly enlarged, but the new facilities will permit increased production. Heat treating equipment for both rods and wire is included in the new mill. The new buildings at Joliet will include a structure with a total length of 480 ft. and a width of 150 ft. on one end and 80 ft. on the other to house the rod mill, together with a new conveyor building 30 ft. x 730 ft. The wire mill will have approximate dimensions of 960 ft. x 1500 ft. Total new floor space will amount to over 1,100,000 sq. ft.

At Waukegan the program includes: More rod storage space, replacement and relocation of rod patenting equipment, replacement of heat treating equipment, replacement and relocation of straightening and cutting and tinning equipment, additional continuous wire drawing and finishing equipment, improvements and replacements in the spring mill, replacement of cleaning house and of iron sulphate facilities, more warehouse space, and an addition to the office. New buildings will include an electro galvanizing building 37 ft. x 525 ft., a straight and cut building 70 ft. x 355 ft., and a sulphate of iron building 60 ft. x 250 ft. The total amount of new floor space at Waukegan will add up to over 183,000 sq. ft.

On the Assembly Line

(CONCLUDED FROM PAGE 64)

ney, but it is now reported that the foundry is to be expanded, perhaps as much as ten times over its present size and production capacity.

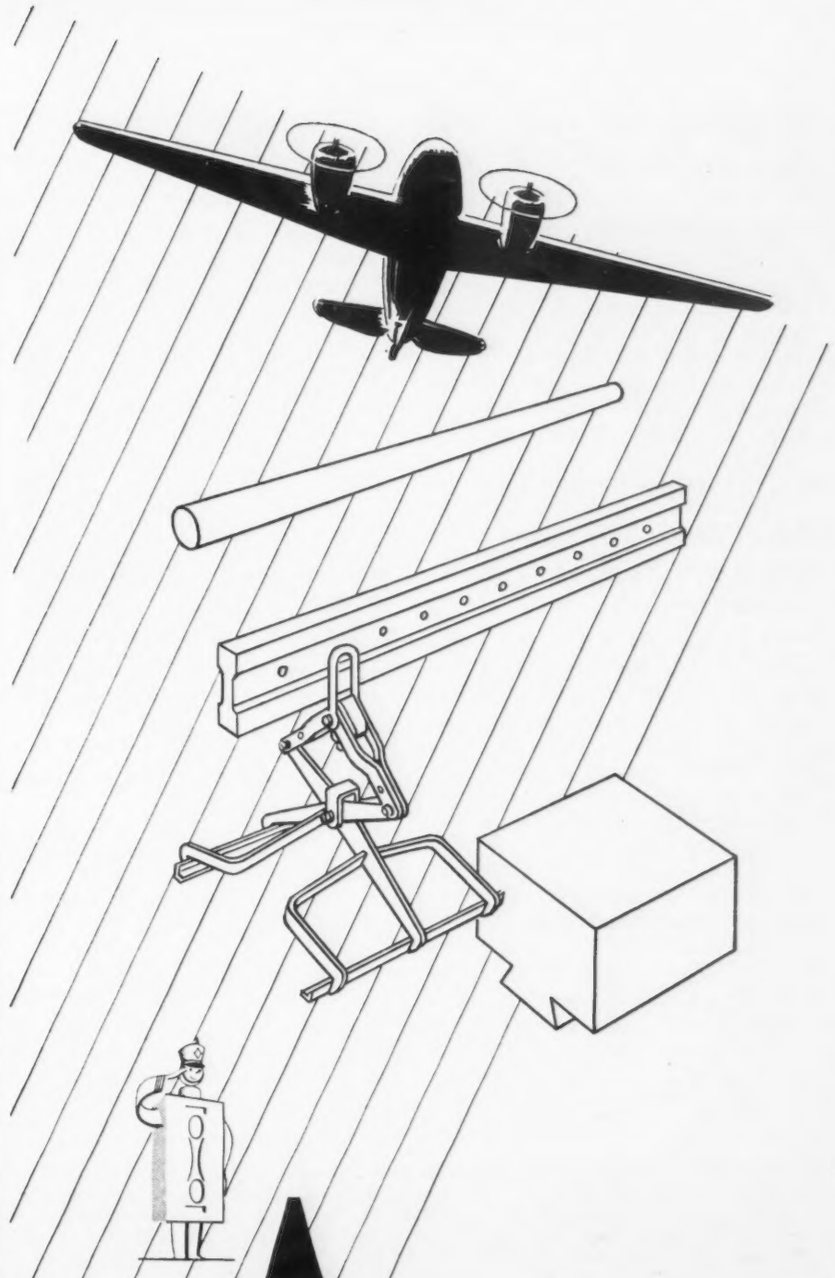
Hand-to-Mouth Buying Forced

Some instances of hand-to-mouth buying are being reported in Detroit but apparently the reason for this is simply the multitude of compulsory restrictions. Among other things it is reported that OPM is holding committments on certain critical materials to current needs, not to exceed 30 to 60 days, and the inability to obtain some materials except in limited quantities is forcing buyers to operate on a hand-to-mouth basis. However, in many other instances it is the practice to make commitments as far ahead as the vendor will accept them.

As a result of these influences, hand-to-mouth buying is 2 per cent of the total reported by the Purchasing Agents Association of Detroit for the month of May; 30-day buying is 1 per cent of the total, and 60-day buying is 6 per cent of the total. These compare with 0 per cent, 3 per cent and 4 per cent, respectively, in April. Because of the mixture of influences (restricting buying on the one hand and forcing long-term buying on the other) 90-day buying has decreased from 29 per cent in April to 24 per cent in May. The long-term influence begins to show up in the figures for six-month buying where the increase has been from 43 per cent in April to 47 per cent in May. Buying nine months in advance was reported by 16 per cent of the buyers in May compared with 18 per cent in the previous month. One year buying has shown a steady increase from 1 per cent in March, to 3 per cent in April, to 4 per cent in May.

Auto Output Still High

The automobile industry turned out 133,565 cars and trucks in the United States and Canada during the past week, compared with 134,682 in the previous week and 90,060 in the corresponding week of last year, according to Ward's Reports, Inc.



The Aircraft Industry

. . . uses, and the manufacturers from whom they buy products use, Heppenstall die blocks for forging parts and products, shear knives for cutting metals, Heppenstall Automatic Safe-T-Tongs for lifting materials, "tailor-made" forgings and other forged products. Heppenstall Company.

Heppenstall

PITTSBURGH · DETROIT · BRIDGEPORT

$3,500,000 Utility Plant Expansion At Cleveland

Cleveland

• • • **The Cleveland Electric** Illuminating Co. has ordered an additional turbo-generator of 50,000 kw. name-plate capacity for installation in its Avon power plant. About $3,500,000 will be spent. "This project is 100 per cent for national defense," Eben G. Crawford, president of the company, said.

Vultee Takes Over Parent Company's Research Unit

Detroit

• • • **Vultee Aircraft, Inc.** has established a Manufacturing Research Department under the supervision of Don I. Carroll, vice president in charge of production. The new department formerly was the research department of Aviation Mfg. Corp. of which Vultee is a division. Peter Altman will continue to serve as director of research, G. T. Gerlach as patent and research engineer, and A. S. Kos as experimental engineer on manufacturing methods and processes. The department will move from Detroit to the Stinson Aircraft Division of Vultee, Wayne, Mich., when new buildings are completed.

Star Shell Plant For Burns City, Ind.

Burns City, Ind.

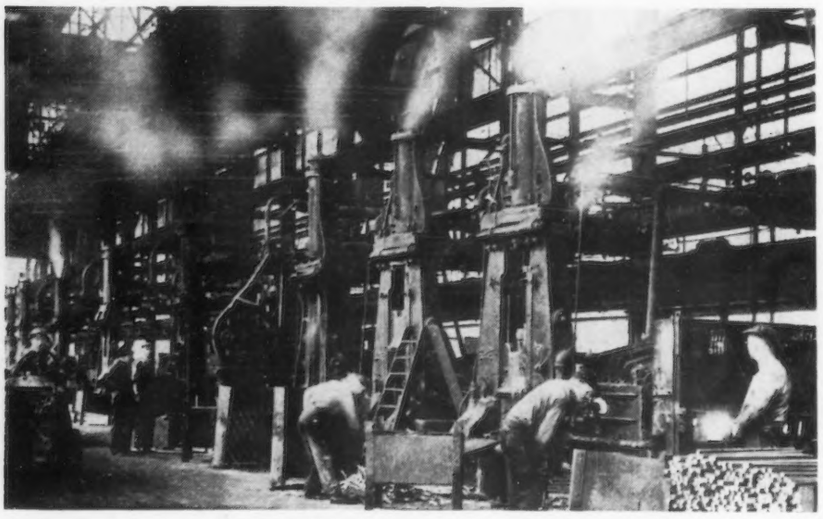
• • • **Construction of a star shell plant will begin here in a month, according to Commander Wallace B. Short, naval officer in charge of the naval powder storage depot. This project will give the depot an area of 42,000 acres, with 450 buildings. Besides the residential, industrial and administrative sections, the high explosive division will have 300 storage magazines and 125 storage units for smokeless powder. Depot includes 100 miles of highways and about 60 miles of railroad tracks. There are still 15,000 acres to be acquired by the government before its total need of 42,000 is realized.**

Southern Drought Threatens Use of Power for Non-Defense

Birmingham

• • • **Curtailment of electricity use** in industrials not engaged in defense work will be necessary if the drought which is hampering hydro-electric production in sections of the Southeast is not relieved at once, J. M. Barry, vice-president of Alabama Power Co., says. For the time being, Barry added, any such curtailment would be voluntary.

48 HAMMERS: Expansion from 28 to 48 hammers will be completed next fall in the forge shop of the Willys-Overland Motors plant at Toledo, Ohio, when the plant will be converted largely to production of aluminum forgings. It is expected to have more hammers in operation than any other forge shop in the country except that of the Aluminum Co. of America at Cleveland, and will increase the U. S. capacity for aluminum forgings by 8,000,000 lb. a year.



Britain's Scrap Supplies Up 50% in 12 Months

London

• • • **George Wood,** Director of Scrap Supplies of the British Iron and Steel Control, announced at the end of May that the stocks of scrap iron and steel at the furnaces, ready for conversion into steel for war industries, are at least 50 per cent higher than they were a year previously.

Scrap is being salvaged from various sources—from buildings damaged by the enemy, derelict factories, wrecks, disused railroad and street car installations, farms, redundant railings, and private dwellings. The recovery of girders from bombed buildings has gone on continually, and means are being adopted to quicken the pace. The dumps of steelwork in some of the parks are drawn on as fast as resources in men and transport permit. Notwithstanding the labor and transport difficulties, which have been acute, a steady stream of scrap has found its way to the steel mills.

Household salvage alone has saved the nation 60 shiploads and enough scrap to build 20,000 tanks, according to Lord Portal, Parliamentary Secretary to the Ministry of Supply.

"It is still vital that the flow of all types of scrap from every possible direction should be kept up and no potential source neglected," declared Mr. Wood, when reviewing the situation recently. Some concern has been expressed that consumers are not getting as much scrap as they would like. Here, again, a long view must be taken. We must provide for the future, and nobody knows how long that future will be.

Springfield, Ill., Opens Drive For Aluminum

Springfield, Ill.

• • • **Residents of** Sangamon County are participating in a "drive" for aluminum pots and pans, starting on June 23. The Abraham Lincoln group is directing the drive to aid defense and has set up an enclosure embracing 24 by 12 ft. on the county courthouse lawn to receive the donations.

General Metals Order No. 1 Extended to Oct. 15

Washington

• • • **Prevention of unnecessary** inventories is assigned as the reason for two changes announced on Monday by OPM Priority Director E. R. Stettinius, Jr., affecting General Metals Order No. 1. One change extended the order to Oct. 15. Originally it was scheduled to expire July 15. The other change provides that customers of suppliers hereafter will not be required to file copies of their compliance affidavits with the Directors of Priorities, as required under the original order. Customers, however, will be required to continue to file monthly statements with suppliers. The affidavit requires the customer to say that he has not effected an increase in inventories over quantities necessary to meet required deliveries efficiently.

Scrap Institutes Midyear Convention July 14 At Detroit

Detroit

• • • **All business** sessions of the midyear convention of the Institute of Scrap Iron and Steel, Inc., will be scheduled for the opening day, July 14, in order to clear the following day for the national golf tournament and other recreational features of the convention. On the first day, with headquarters at Hotel Statler, Detroit, all committees will meet in the morning, the board of directors will hold its session at noon, while the afternoon will be devoted to a general business meeting, concentrating on defense problems.

Railroad to Spend $48.5 Million

St. Paul, Minn.

• • • **Great Northern Railway** will spend $48,500,000 on a system-wide improvement program, providing employment for 4000 this summer. Plan is underway now in about ten states in which the road operates. Expenditures of $25,135,000 will be made for maintenance of way, structures and equipment; $5,793,099 for new facilities and improvements on present equipment; $17,498,000 for purchase of new equipment.

Suprex Gage Organized By N. A. Woodworth

Detroit

• • • **Organization of Suprex Gage Co.** at 420 Ten Mile Road, Pleasant Ridge, Mich. (suburb of Detroit) has been announced by N. A. Woodworth, president. The plant, newly equipped with machine tools and up-to-the-minute temperature control equipment, is in production and will make deliveries next month.

N. A. WOODWORTH W. F. KLEMM

Initial production will include plug and ring gages (straight and tapered); thread plug gages; and various types of Carboloy-faced gages. It will have a salvage department to rebuild all types of gages with hard chrome plating.

Woodworth is well known in the tool and machine tool industry, having founded Ex-Cell-O Corp. in 1919 and having served as its president until 1937. Two years ago he formed the N. A. Woodworth Co. to manufacture precision parts for aircraft engines. He continues as president of this company.

William F. Klemm has been named general manager. Klemm received his technical education in Europe, was associated with Ex-Cell-O for nine years and organized the Metro Tool & Gage Co. of Chicago.

Woldman New Chairman of Metropolitan Foundrymen

New York

• • • **Dr. N. E. Woldman**, chief metallurgical engineer, Bendix Aviation Corp., Bendix, N. J., has been elected chairman of the Metropolitan Chapter of American Foundrymen's Association, succeeding R. J. Allen, Worthington Pump & Machinery Co., Harrison, N. J. Other new officers include F. G. Sefing, International Nickel Co., vice-president; K. A. DeLonge, International Nickel Co., secretary; and T. D. Parker, Climax Molybdenum Co., New York, treasurer.

ARMS AND THE AUTO: Posters like these appearing recently on one of the world's largest poster boards maintained (at Detroit), by Dodge, point to the coming transformation of the automobile industry into a mighty defense machine.

New Castle Not A "Ghost Town;" Its Industry Thrives

New Castle, Pa.

• • • **Far from becoming** a "ghost" town, a status predicted for it not so long ago by an SWOC research worker, this thriving industrial and business community of more than 47,000 is engaged in a well diversified maximum production for national defense.

Local leaders believe the emphasis placed by the SWOC leader on the city's dependence on steel working plants, especially some which were curtailed or closed by U. S. Steel, was out of all proportion to the actual industrial conditions here where more than 107 different industries are represented.

With Carnegie-Illinois Steel Corp.'s Shenango tin plate works to go on partial and temporary operation soon, after having been shut down for some time, approximately 1000 employees will be needed and if current signs are correct, it will be no easy matter to find all of these workmen.

Housewives in New Castle these days are doing a larger share of their own work since girls who previously were doing maid work have flocked to the Shenango Pottery Co., where employment has zoomed from 800 to 1800 within a short space of time, partly due to Army and Navy orders for chinaware and other pottery.

The Johnson Bronze Co. with an increased employment list of more than 1300 employees is practically 75 per cent on direct or indirect national defense production. Bronze bearings and bushings are being made for airplanes, tanks, guns, ships, diesel engines and gun mounts and in addition to this the company is supplying distributors with material and parts, most of which eventually find their way into national defense articles. There is no doubt among Johnson Bronze officials that within the near future the plant will be 100 per cent on armament work and if more machine tool operators were available, production could be pushed even higher.

Blair Strip Steel and Elliott Bros. Steel Co. here, both makers of cold rolled specialty strip, are finding their output going in to an increasingly larger percentage of national defense work. The Elliott Co. estimates that already 60 per cent of its business is concentrated on various important and intricate strip production leading ultimately to parts for Army and Navy ordnance materiel.

Pennsylvania Engineering Co., one of the world's largest plants for making steel production equipment in the open-hearth, bessemer and blast furnace field, finds its machine shop capacity running at practically 100 per cent and its plate fabricating plant operating at more than 60 per cent. More prompt deliveries on steel plates would immediately boost plate fabricating to virtual capacity. The definite assurance that the steel industry will begin a substantial expansion in ingot output over and above what is already under way, practically assures maximum production indefinitely at Pennsylvania Engineering, provided additional material and workmen can be found.

Five smaller plants in this city, including the Garland Mfg. Co., the Lockley Machine Co., the Forney Machine Co., the Vitale Fire Works Co. and the Fricker Mfg. Co., are cooperating with each other under a plan similar to the York setup whereby one of the five companies accepts major government contracts and sublets parts to the others. This group of small companies is capable of and has completed production on parachute flares, practice bombs, aerial bomb fins and machine parts for tanks. The coordination of this activity is under the chairmanship of R. H. Cunningham, Union Trust Bldg., New Castle.

The Pennsylvania Railroad has stepped up production here at its open air freight car shop and is turning out two cars a day while the Baltimore & Ohio Railroad has stepped up its maintenance work considerably.

The distinct impression here is that despite the national defense program this city has enough diversified industries which have grown up over the past several years so it stands no chance of fulfilling the dire prediction based on unfounded information that this city would turn into a "ghost" town.

Plants May Load 150 Cars of Shells Daily

Kingsbury, Ind.

• • • **Immediate 25 per cent** expansion of the Army's ammunition loading plant is assured with additional award of $8,997,000 for that purpose.

The arsenal here comprises 13,000 acres, has five shell-loading lines, first of which is scheduled to begin operation next month. An additional line is almost certain to be added under the new appropriation. Structures will probably be increased from present 335 to a total of 400. If shell-loading capacity is expanded by one-third, as the Army officials hope, daily production would be upped to about 210,000 rounds, or 150 freight car loads of finished ammunition. Shells range from 20 to 105 mm.

Enlargement is expected to increase employment from around 10,000 up to 11,335. About 30 per cent of the production workers will be women. The expansion does not mean that more land will be added or that type of work will be changed.

A.S.M.E. Prepares Standard For Steel Welding Fittings

• • • **An American standard** for steel socket-welding fittings has been drawn up by the American Society of Mechanical Engineers, and is now being distributed to industry for criticism and comment. Copies of the proposal, which covers over-all dimensions, tolerances and marking for wrought and cast carbon and alloy-steel welding fittings, can be obtained from the society's offices at 29 West 39th Street, New York.

Douglas and Bell Aircraft Share $10 Million Award

Washington

• • • **The Douglas Aircraft Co.,** Inc., of Santa Monica, Cal., has been awarded a $3,119,435 contract for airplanes and spare parts, and the Bell Aircraft Corp. of Buffalo has received a similar contract for $7,407,540 from the War Department, it was announced last week.

Photo by Wide World

NEW ARMOR PLANT: Henry Disston & Sons, Inc., recently opened a new $1,200,000 plant unit at Philadelphia, tripling its capacity for making armor plate.

Cimatool, Sheffield Gage Merger is Completed

• • • **The Cimatool Co.** merged into Sheffield Gage Corp. with a change in name to the Sheffield Corp. has been organized functionally into the Gage Division, the Machine Tool Division and the Special Tool and Die Division. In charge are O. M. Poock, chairman of the board; Louis Poock, president and general manager; C. H. Reynolds, vice-president, and O. A. Ahlers, assistant general manager.

8 to 11c. Pay Increases For Apollo Workers

Apollo, Pa.

• • • **A five-week shutdown** of the Apollo Steel Co. here was ended last week by a compromise agreement between the SWOC and the company, following conferences at Washington between SWOC officials, a government conciliator and O. M. Oppenheimer, company president, and other company executives.

Wage increases of 11c. an hr. will be granted to 300 hourly rated employees and 8c. an hr. to approximately 700 tonnage men, according to the union. The company had previously offered 10c. an hr. for the hourly men and 5c. for the tonnage men. The union's request for restoration of a 10 per cent cut made in 1938 was not granted, according to spokesmen for both sides.

Expansion Planned Before Valve Plant Erection Begins

Cleveland

• • • **Even before the receipt** of structural steel for a new $15,000,000 aircraft engine valve plant here, plans to double its size are being considered. Under the greatly expanded aircraft program which is now being formulated valve output must be stepped up. Makers of other aircraft parts also will find it expedient to study possibilities of expansion.

The valve plant here is going to be operated by Thompson Aircraft Products, Inc. in suburban Euclid. It is a government-financed subsidiary of Thompson Products, Inc. The Euclid site contains more than 100 acres. The company has started training about 100 men but expects to employ about 4000 at the new plant eventually.

Awards for Defense Plant Construction Set Record

New York

• • • **Awarding of contracts** for heavy engineering construction projects, reflecting renewed plant expansion activity under the Lend-Lease Act, last week set a new record for the present year when contracts totaling $173,306,000 were placed, according to *Engineering News-Record.* This total represents a gain of 24 per cent over the $139,825,000 volume of the preceding week.

The week's gain was due entirely to defense work underwritten by the government.

Philadelphia Steel Club Holds 22nd Annual Party

Philadelphia

• • • **The Steel Club** of Philadelphia held its 22nd annual golf party, Friday, June 20, at the Aronomink Golf Club, Newtown Square, Pa. The golf tournament was followed by a dinner for about 230 members and guests. R. W. Dietrick, president of the Baltimore Steel Club was one of the guest speakers.

Industrial Electric Truck Orders Decline

• • • **Unit domestic bookings** of electric industrial trucks and tractors during May declined almost 25 per cent below those of March and April, figures just released by the Industrial Truck Statistical Association, Chicago, indicate. May bookings totaled 320 units. As compared with May of last year, when 103 units were booked, they represented an increase of about 210 per cent.

Total net value of chasses only booked during May was $1,234,936 compared with $1,557,591 in March and $1,472,225 in April and $387,503 in May of last year.

Nineteen non-elevating platform trucks with capacities and base chasses prices ranging from 2000 to 6000 lb. and $1730 to $3780 respectively had a net value of $46,534. All net values are at factories, after additions and deductions for variations from standard specifications, trade-in allowances, etc., when applicable. There were also 273 cantilever trucks with capacities and base chasses prices ranging from 1000 to 20,000 lb. and $1985 to $14,340 respectively, with a total net value of $1,048,778.35; eight light and heavy duty tractors with base chasses prices ranging from $1550 to $1790 and a total net value of $12,860; 20 crane trucks with capacities and base chasses prices ranging from 2500 lb. at 20 ft. radius to 10,000 lb. at 5½ ft. radius and $4045 to $8150 respectively, had a total net value of $126,764.

No cancellations of 1941 bookings were reported during the month so no adjustments have been made in the above figures. However, the cancellation of a 6000 lb. at 7 ft. crane truck with a value of $5060 booked in May, 1940, was reported.

Trade Association Men Barred from OPM

• • • **An OPM policy** making trade association officials ineligible for employment in the defense organization was disclosed this week with the resignation of C. W. Kellog, president of the Edison Electric Institute, who has been OPM's chief power consultant.

April Manganese Imports 14,301 Tons

Washington

• • • **With Brazil supplying** 4483 gross tons, the largest quantity from any single country, imports of manganese ore (35 per cent or more manganese) for consumption totaled 14,301 tons, manganese content, in April, according to the Bureau of Mines. Ranking next to Brazil as a source of imports was the Union of South Africa which supplied 3546 tons, followed by Cuba, 3167 tons. Other sources were the Gold Coast, 1495 tons; India, 833; Chile, 712 and Mexico, 15.

General imports of metallurgical manganese ore were 33,422 tons, manganese content. These imports comprise ore of which part went into immediate consumption and the remainder entered bonded warehouses. The countries of origin and tonnages they supplied were Union of South Africa, 15,198; Brazil, 8,289; India, 6057; Cuba, 3167; Chile, 696; Mexico, 15.

Domestic production of manganese ore containing 35 per cent or more manganese (natural) during April, 1941, was 2300 gross tons, shipment were 2600 tons, and producers' stocks at the end of the month were 1800 tons. These figures are predicted on reports received from producers that accounted for 84 per cent of the total in 1940. In March, production was 1800 tons, shipments were 2000 tons, and producers' stocks at the end of the month were 2100 tons. The rate of shipments averaged 3344 tons monthly in 1940, when the total amounted to 40,123 tons.

Industrial Milestones

• • • **Logansport Machine, Inc.,** Logansport, Ind., manufacturer of air and hydraulic devices, chucks, cylinders, valves, presses and accessories, in July will commemorate the 25th anniversary of its founding by Frank B. Wilkinson.

"We have witnessed the rapid advancement of the machine tool and are proud of the part 'Logan' air and hydraulic equipment has played in its development," officials say of the company's quarter-century history.

Defense Effort Seen Speeded by Revisions In Steel Price Order

• • • **Expedition of** national defense effort, increased net earnings for the steel industry, and a breathing spell for some of the smaller non-integrated steel units are expected to follow the OPACS revision in its steel price order announced late last week.

Main adjustment is the permission granted steel companies to charge prices predicated on the basing point nearest to the point of production instead of on the governing basing point producing the lowest delivered price. An example covering the revision as well as the previous set up follows: A Pittsburgh mill making plates and delivering into Chicago territory may now charge the consumer the F.O.B. Pittsburgh price, plus transportation. Under the original order the Pittsburgh maker was compelled to use the Chicago basing price on plates and absorb the freight differential.

For the past several months steel companies have had all the business they can handle "in their own back yards" but the latest revision will allow them to fulfill national defense orders emanating from distant points at no undue hardship.

No wholesale reallocation of customer accounts is expected to result from the latest order. Regular customers with defense business will be served as promptly as in the past, no matter where they are located. However, Eastern and Midwestern mills will participate to a greater extent in ship plate and other tonnage going to the West Coast, since basing points nearest point of production can be utilized "if the customary means of transportation are not used."

In view of the inability of steel companies to obtain steamship space for delivery to the West Coast, railroad transportation must be utilized and under such conditions a Cleveland mill, for instance, can charge the F.O.B. Cleveland price for material, plus the transportation cost to the West Coast. Heretofore mills were forced to utilize the Pacific and Gulf port basing point prices

which entailed considerable freight absorption when all-rail transportation was used in place of rail and water.

Steel industry earnings are expected to be enhanced by the latest revision because eventually steel deliveries will be priced at the basing point nearest the point of production, plus transportation cost. Freight absorption since the first steel order was issued has been substantial. Whether or not all steel business will be immediately priced in accordance with permission granted in the revised steel pricing order remains to be seen, but there is little doubt that a large portion will be billed on the basis of the latest setup.

Small integrated companies and small non-integrated companies who are being allocated defense tonnages will find the going a little easier since they will not have to absorb heavy freight charges as has been the case recently.

Steel companies, most of which will probably be some of the smaller units which charge higher than the so-called published basing point price during the third quarter of 1940, may use those prices which were announced or customarily quoted as base prices in the third quarter of 1940.

Another important revision in the price order was that of basing ceiling prices on quotations in effect on April 16, instead of March 31 as in the original order. This alteration is intended to cover certain changes in extras, including galvanized pipe and nails, which were instituted between March 31 and April 16.

An alternative ceiling for export prices was also announced in the revised order. This subject is covered in the market section of this issue under "Export Trade."

See market section for further details of the revised price order.

Kelsey-Hayes to Build $5,800,000 Gun Plant

Washington

• • • **A lease agreement** under which the Kelsey-Hayes Wheel Co., Detroit, will construct and equip a $5,800,000 plant for the manufacture of machine guns for the War Department has been approved by the RFC.

Auto Makers Against Hysterical Production Cuts

Detroit

• • • **Anticipating that** diversion of necessary materials to defense work will eventually result in sharp curtailment of auto production, the industry still hopes that premature and hysterical cutting of schedules will not be forced on it.

Regarding prices, none of the companies addressed by Leon Henderson's OPACS request days ago has given any answer yet to his suggestion that recent price increases on new cars be withdrawn. Further word from Henderson, perhaps a price freezing order, is anticipated here by some.

Apparent desire to avoid drawing further fire on these issues from Washington is behind the industry's silence in official quarters on both issues.

The most far reaching and all-inclusive labor contract in American industry is in effect in all plants of Ford Motor Co. as a result of a signing of a pact last Friday between Ford and the UAW-CIO in Washington.

Detroit, in the dark about progress of negotiations since they were carried on almost secretly in Pittsburgh and Washington, received the news of the signing with consternation. Immediately prospects of UAW-CIO pressure for similar concessions in other auto plants were envisioned.

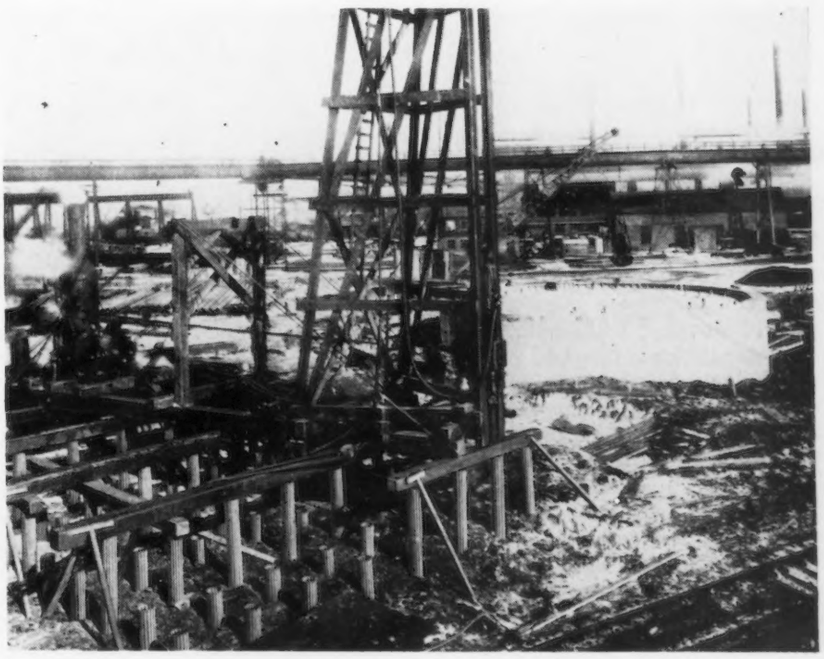
Mr. Henderson said on Tuesday that his office is considering the imposition of a price schedule on high speed tool steel scrap and other types of high tungsten content scrap. Such scrap Mr. Henderson said, has been selling for $1.80 a pound of contained tungsten for solids analyzing 12 per cent or more of tungsten with varying differentials below that level for other grades.

Fuller Resigns as OPM Materials Branch Head

Washington

• • • **Samuel R. Fuller, Jr.,** has resigned as head of the OPM materials branch to return to the presidency of the North American Rayon Corp. R. C. Allen, OPM consultant on ferrous minerals, has been granted an indefinite leave of absence to return to the Oglebay, Norton and Co., of Cleveland, of which he is executive vice-president.

NO WOOD: Pictured here is an arrangement that saved several thousand dollars in construction of this 900-ton capacity blast furnace foundation. Instead of the usual expensive method of wood cribbing underneath the pile driver, the contractor, according to the Union Metal Mfg. Co., Canton, Ohio, used steel piles.



Personals

Change is inevitable in progressive Industry. Change is constant.

• **Charles D. Mills** has been appointed manager, raw materials, fuel and power division, Pittsburgh district, Carnegie-Illinois Steel Corp., succeeding **C. B. Getsinger,** who was recently appointed supervisor of fuel and power, Carnegie-Illinois.

Mr. Mills joined the engineering department of the former Carnegie Steel Co. at New Castle, Pa., in 1919 and became efficiency engineer at the New Castle plant later in the same year. In 1932 he went to the general offices of the company in Pittsburgh as a special engineer. From 1933 until 1935 he was fuel engineer at the Clairton works, returning to the Pittsburgh office in December, 1935 and in June, 1936, was made special engineer in the raw materials, fuel and power division.

• **C. M. Maratta,** since 1921 maintenance engineer for the Timken Roller Bearing Co., Canton, Ohio, has been appointed chief works engineer, to succeed the late W. C. Makley. **Walter F. Green,** who has been with the engineering department since 1935, becomes assistant works engineer, and **Putney L. Wright,** with Timken for the past four years, will be plant engineer. Mr. Maratta served as power plant inspector of the Pennsylvania Railroad for seven years, draftsman for the Westinghouse Electric & Mfg. Co. for four years and joined the Timken company as a draftsman in 1917.

• **Theodore C. Cederholm** has been made district manager of sales, Wyckoff Drawn Steel Co. in the Boston and New England territory, to succeed **Alden F. Erikson,** who has been called for active duty with the 68th Coast Artillery Anti-Aircraft Regiment. Mr. Cederholm has been affiliated with the Hawkridge Brothers Co. for the past seven years.

• **John F. Byrne,** of Pittsburgh, has been appointed general manager of Koppers United Co.'s newly-created blast furnace division which includes the two blast furnaces which have been purchased from the Granite City Pig Iron Co., Granite City, Ill. Mr. Byrne has been with Koppers since 1925 when he joined the company in Chicago as a research chemist. He successively served as research chemist in Pittsburgh and chemist in charge at Chicago before being transferred to the financial department in 1930. For several years he has been assistant to the vice-president in charge of finance.

• **Vernon R. Drum** has been elected vice-president in charge of manufacturing of Willys-Overland Motors, Inc., Toledo, and **Lester S. Lowry** has been named treasurer. Mr. Drum started his career in the auto industry as a tool maker in 1908, was chief inspector for Willys-Overland in 1920-24 and, after a number of years with Chrysler Corp., returned to Willys last December as operating manager.

• **J. R. Spence,** for many years active in the hard-facing industry, has been appointed general sales manager of the Stoody Co., Whittier, Cal. He has been indentified with the company for the past six years, serving first as chief metallurgist and later as industrial sales and research manager.

J. R. SPENCE, general sales manager, Stoody Co.

• **Frank B. Harrington,** assistant plant manager of Lansing Fisher Body Division, has been named acting manager for Fisher Body's Flint Division Plant No. 2. **Louis P. Cramer,** who has been general plant superintendent at Lansing since 1940, will succeed Mr. Harrington as assistant plant manager. **George H. Cameron,** plant shift superintendent, becomes general plant superintendent and **Lion E. Pender,** body shop superintendent, succeeds Mr. Cameron.

• **H. H. Rothrock,** formerly head of the Industrial Engineering department, University of Pittsburgh, has been made assistant to the chief industrial engineer of Carnegie-Illinois Steel Corp., Pittsburgh. He joined the Westinghouse Electric & Mfg. Co. in 1919 and later became director of wage incentives. He joined the faculty of the University as professor and head of the department of industrial engineering in 1933.

• **Alexander W. Strachan** has been appointed superintendent of rod mills at Donora, Pa., for American Steel & Wire Co. Mr. Strachan started with the wire company in April, 1917, as a cold roll helper at Cuyahoga works in Cleveland.

• **Fred W. Ford** has been named purchasing agent of Ryan Aeronautical Co., San Diego, Cal. He has been with the Ryan company since September, 1940, as sales engineer. His previous aircraft experience has included purchasing work for Seversky Aircraft Corp. and for Stinson Aircraft division of Aviation Mfg. Corp.

• **R. G. Koch** has been elected vice-president of H. Boker & Co., New York.

• **H. O. Berryman** and **Paul H. Schmitz** have been elected vice-presidents of National Can Corp., New York.

• **Harry McCool, Jr.,** has been appointed South Western sales representative for the Steel & Tube Division of Timken Roller Bearing Co., Canton, Ohio. His territory includes, Kansas, Louisiana, Oklahoma, Arkansas and Texas, with headquarters at Dallas. Mr. Mc-

Cool joined the company in 1928 as hot mill operator and was advanced to superintendent of the tube mill at Wooster, Ohio, in 1935. He was transferred to the sales department of the company early this year.

• **Arch R. Smith** has been named sales manager of the Ready-Power Co., Detroit. Mr. Smith formerly was manager of industrial sales division of Continental Motors Corp. and has been active for years in the materials handling field.

• **E. J. Hergenroether,** who has been research engineer for International Nickel Co., Inc., in the Detroit office, now is associated with the OPM on the program for substitutions in the production division of the conservation section.

• **H. F. Zimmerman,** superintendent of electrical maintenance at the Gary sheet and tin mill of Carnegie-Illinois Steel Corp., has been elected chairman of the Chicago section of the Association of Iron and Steel engineers for the 1941-42 season.

• **Dr. Campbell Rogers McCullough** has been transferred from the research staff of the phosphate division, at Anniston, Ala., of Monsanto Chemical Co., to the central research department at Dayton.

• **Francis T. McGuire,** who has been a teaching fellow in the department of metallurgy at the University of Notre Dame for the past two years, has been made assistant professor of metallurgy in the University of Kentucky. He received his Ph.D. degree from Notre Dame at the June commencement.

• **Sherman Barnes,** in charge of the western New York territory of Ampco Metal, Inc., Milwaukee, has established new headquarters at 699 Potomac Avenue, Buffalo.

• **Samuel Reid** has been added to the sales engineering staff of the Cochrane Steam Specialty Co., Boston.

• **Fred V. Gardner,** Milwaukee consulting engineer, has been elected president of the Smith Steel Foundry Co. of that city, to succeed **Edward A. Bacon,** who was named chairman. Mr. Bacon recently was made a lieutenant-commander in the Navy and is stationed at headquarters of the ninth naval district at Great Lakes, Ill.

• **Q. B. Bechaud,** Fond du Lac, Wis., has been elected president of the Scientific Lighting, Inc., that city, maker of fluorescent lighting equipment. He succeeds **W. L. Mack, Chicago,** who resigned as president, director and sales manager.

• **William W. Coffeen** has been appointed associate for the Porcelain Enamel Institute at the National Bureau of Standards. He has been instructor in ceramic engineering in the Georgia School of Technology of Atlanta. Prior to that Mr. Coffeen served as research fellow at the University of Illinois Experiment Station for two years and later as ceramic engineer for the Canton Stamping & Enameling Co., Canton, from 1937 to 1939.

• **R. M. Cleveland,** for the past 24 years identified with the Worthington Pump & Machinery Corp., Harrison, N. J., has been appointed manager of its Boston office, succeeding **W. A. Finn,** who has been called to active duty with the Navy. Mr. Finn has been with Worthington since resigning his commission as a Naval officer in 1926.

• **R. D. Yoder** has been transferred from the Milwaukee headquarters of Cutler-Hammer, Inc., to the company's Cincinnati office.

Obituary

• **Warren Gilman Jones,** president of the W. A. Jones Foundry & Machine Co., Chicago, died of heart disease at his home in River Forest, Ill., on June 6, aged 51 years. He joined his father's firm in 1910 and had been president since 1925. He was also vice-president of the Sackett Screen & Chute Co.

• **George L. Bennett,** formerly president of the machine tool company of the same name, now the Bennett-Rafkin Machine Tool Co., New York, died at his home in St. Albans, N. Y., of heart disease on June 3, aged 69 years. He was at one time identified with the G. A. Gray Co. and J. J. McCabe before establishing his own firm in 1916. He retired in 1932.

• **Louis Chevrolet,** once internationally known race driver and designer of the first of the cars which carry his name, died recently in Detroit. As a boy he produced his first invention, a wine-barrel pump. Later, like many others who eventually became prominent in the automobile industry, he started manufacturing bicycles, also inventing a machine to make tires. After serving an apprenticeship in the automobile industry in France, he came to this country. He started his racing career in 1905. However, his greatest distinction came as an engineer and designer of both stock and racing cars. In 1911 he organized Chevrolet Motor Car Co. and headed the concern until 1915. In the years after that he built the Frontenac racing car and later the Monroe. He adapted his Frontenac cylinder head to Ford's engine and marketed them. In 1925 he extended his racing activities to motor boats. With his brother, Arthur, he organized the Chevrolet Brothers Aircraft Co. in 1928.

• **Frederick Ahrens,** one of the founders of the Waukesha Motor Co., Waukesha, Wis., died recently in a Milwaukee hospital at the age of 70 years. Together with Harry Horning, Mr. Ahrens started the company. Mr. Ahrens later became superintendent but after several years left to become associated with a Gary, Ind., steel mill where he remained until about a year ago.

• **John C. Laundry,** secretary of the Generated Gear & Machine Co., Detroit, was buried June 16. Mr. Laundry was born in Springfield, Vt., 58 years ago and had been a resident of Detroit for 27 years.

• **Joseph G. Johnston,** former Detroit district manager of the American Car & Foundry Co., died recently in Fremont, Ohio. Born in New Hagerstown, Ohio, in 1850, Mr. Johnston went to Detroit in 1879 with the late Col. Frank Hecker, founder of American Car and remained with it until his retirement in 1927.

The Iron Age Comparison of Prices

Advances Over Past Week in Heavy Type; Declines in Italics

	June 24, 1941	June 17, 1941	May 27, 1941	June 25, 1940
Flat Rolled Steel:				
(Cents Per Lb.)				
Hot rolled shets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Tin and Terne Plate:				
(Dollars Per Base Box)				
Tin plate	$5.00	$5.00	$5.00	$5.00
Manufacturing ternes	4.30	4.30	4.30	4.30
Bars and Shapes:				
(Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Wire and Wire Products:				
(Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails:				
(Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel:				
(Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Wire Rods and Skelp:				
(Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 120-126 herein.

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

	June 24, 1941	June 17, 1941	May 27, 1941	June 25, 1940
Pig Iron:				
(Per Gross Ton)				
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$24.84
No. 2, Valley furnace	24.00	24.00	24.00	23.00
No. 2, Southern Cin'ti	24.06	24.06	24.06	23.06
No. 2, Birmingham	20.38	20.38	20.38	19.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	23.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	24.34
Basic, Valley furnace	23.50	23.50	23.50	22.50
Malleable, Chicago†	24.00	24.00	24.00	23.00
Malleable, Valley	24.00	24.00	24.00	23.00
L. S. charcoal, Chicago	31.34	31.34	31.34	30.34
Ferromanganese‡	120.00	120.00	120.00	120.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton. ‡For carlots at seaboard.

Scrap:				
(Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.25
Heavy melt'g steel, Phila.	18.75	18.75	18.75	20.00
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.50
Carwheels, Chicago	....	....	....	19.00
Carwheels, Philadelphia	....	....	....	22.75
No. 1 cast, Pittsburgh	22.00	22.00	22.00	20.75
No. 1 cast, Philadelphia	24.00	24.00	24.00	22.25
No. 1 cast, Ch'go*	21.00	21.00	21.00	17.25

*Changed to gross ton basis.

Coke, Connellsville:				
(Per Net Ton at Oven)				
Furnace coke, prompt	$6.125	$6.125	$6.125	$4.00
Foundry coke, prompt	6.875	6.875	6.875	5.25
Non-Ferrous Metals:				
(Cents per Lb. to Large Buyers)				
Copper, electro., Conn.*	12.00	12.00	12.00	11.50
Copper, Lake, New York	12.00	12.00	12.00	11.50
Tin (Straits), New York	52.75	53.00	52.125	52.25
Zinc, East St. Louis	7.25	7.25	7.25	6.25
Lead, St. Louis	5.70	5.70	5.70	4.85
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

*Mine producers only.

Composite Prices

	FINISHED STEEL	PIG IRON	SCRAP STEEL
June 24, 1941	2.261c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.261c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.261c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.261c. a Lb.	$22.61 a Gross Ton	$19.58 a Gross Ton

	High	Low	High	Low	High	Low
1941			$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.261c., Jan. 2	2.211c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.286c., Jan. 3	2.236c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.512c., May 17	2.211c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.512c., Mar. 9	2.249c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1936	2.249c., Dec. 28	2.016c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.062c., Oct. 1	2.056c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.118c., Apr. 24	1.945c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.953c., Oct. 3	1.792c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.915c., Sept. 6	1.870c., Mar. 15	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.981c., Jan. 13	1.883c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.192c., Jan. 7	1.962c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.236c., May 28	2.192c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Summary of the Week

• Lines are being drawn tighter on supplies of steel and other metals, foreshadowing further curtailment in non-defense manufacturing . . . Pittsburgh estimates 65 to 70 per cent of current production is earmarked for defense . . . Steel price ceiling order amended.

THE new phase of the war in Europe will undoubtedly result in an intensification of the effort to aid Great Britain and build up our own defense. As this prospect looms, the lines are being drawn tighter on supplies of steel and other metals of those not engaged in defense activities. Some manufacturing plants have already been forced to curtail operations because of inability to obtain sufficient steel, and a further tendency in this direction appears to be inevitable over the coming months.

Shipments of steel to the automobile industry are being delayed or cut down in anticipation of the approaching end of the current model season and the fact that motor car production is to be curtailed beginning in August. It now appears that this curtailment may be considerably more than the 20 per cent originally agreed upon. With wide strip mills now operating at 50 per cent or more on plate tonnage, the inability of the motor car makers to obtain a sufficient supply of sheets and strip will in itself dictate further reduction of automobile production schedules.

WITH the growing use of preference ratings for direct and indirect defense requirements, the amount of steel remaining for civilian consumption is shrinking to such an extent that non-defense consumers are likely to be pinched much more severely than has been generally expected.

The allocation recently of large tonnages of steel for ships, cars, shells, pipe lines and for shipment to Great Britain has complicated the delivery situation for commercial steel users to a serious extent. It is estimated at Pittsburgh that fully 65 to 70 per cent of current steel production is earmarked for preferential treatment, leaving a relatively small amount for other consumers. The fact that railroad requirements have been given an A-3 preference rating and the growing volume of railroad orders have complicated the production and delivery problem for the steel mills. Railroad orders in the past week included 12,000 freight cars, 12 locomotives and 160,000 tons of rails. About 500,000 tons of rails have recently been ordered, but these are for 1942 delivery. Cars and locomotives are wanted earlier.

The Treasury Department has allocated 462,000 tons of semi-finished and finished steel for the British and the balance of a 1,000,000-ton requirement is to be placed later.

Meanwhile, the steel industry is pushing operations upward to the fullest extent possible, but is hampered somewhat by the growing shortage of scrap. However, this week the industry average has risen above 100 per cent for the first time this year, being estimated by THE IRON AGE at 100.5 per cent. Only five of the 13 districts for which calculations are made by THE IRON AGE are at less than 100 per cent, most of the others being well above that figure. A definite development in projected increase in capacity is the announcement by the OPM that western companies will undertake programs to add 1,556,000 tons of ingot capacity, divided among the Columbia Steel Co., Bethlehem Steel Co., Colorado Fuel & Iron Corp., and the Pacific State Steel Co. The United States Steel Corp. is considering the removal of two old blast furnaces at Braddock, Pa., or two at Joliet, Ill., to Provo, Utah, where its western iron mines are situated. The adequacy of pig iron supplies is as serious a question now as the scrap supply situation in efforts to increase steel production.

A MEASURE of relief from the steel price ceiling order was afforded last week by Price Administrator Henderson, who has permitted the steel companies to quote prices predicated on the basing point nearest to place of production, thus giving the steel companies a higher net price on long haul deliveries, and also to quote higher than domestic prices on export sales. The effective date of the steel ceiling order was changed from March 31 to April 16, thus giving effect to a few price changes that occurred between those dates, notably one of $6 a ton on galvanized pipe. This order will also expedite the defense effort as eastern and midwestern mills will be encouraged to take West Coast business, to which they have objected because of the net loss involved through the current necessity of shipping all-rail in many instances.

The Price Administrator also amended the scrap price order, permitting some minor adjustments designed to facilitate the flow of scrap.

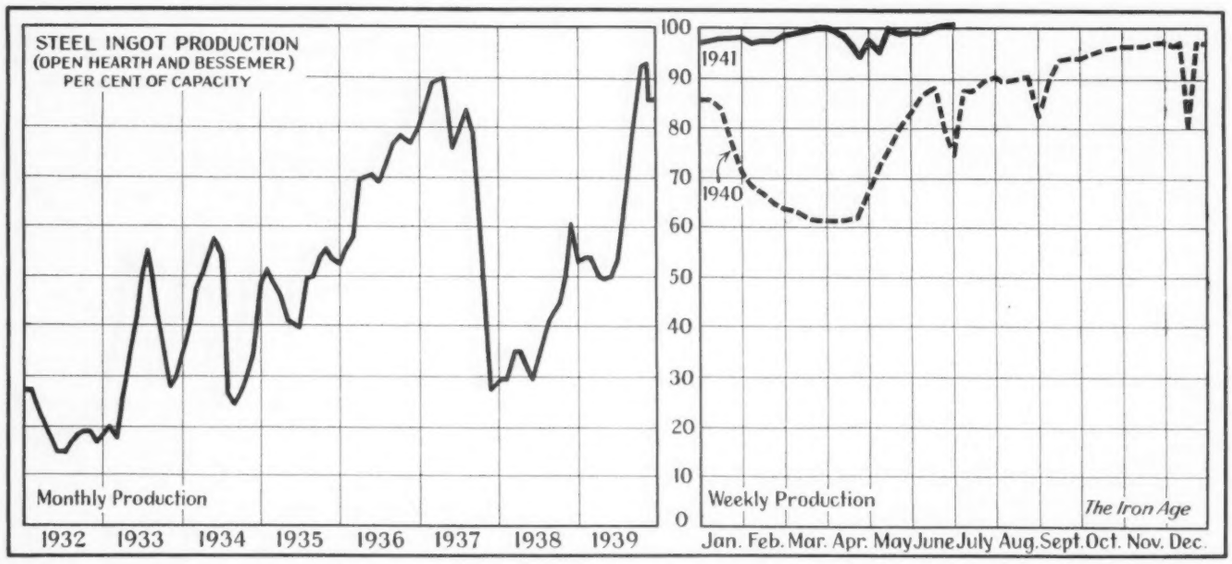
The Industrial Pace . . .

Paced by a surge in new plant construction, a consequence of activity under the Lend-Lease Act, which boosted heavy construction awards for the past week to a new high for the present year, THE IRON AGE index of capital goods activity rose 3.1 points in the past week in the sharpest upward movements of the past two months. The index at the close of the week stood at 118.4, as compared with 115.3 in the previous week.

While the construction series registered the sharpest individual rise, all the other factors of the index also gained ground. The unusually large advance in the Pittsburgh series was a reflection of resumption of normal activity in the district's bituminous coal mines following shutdowns caused by heavy floods earlier in the month.

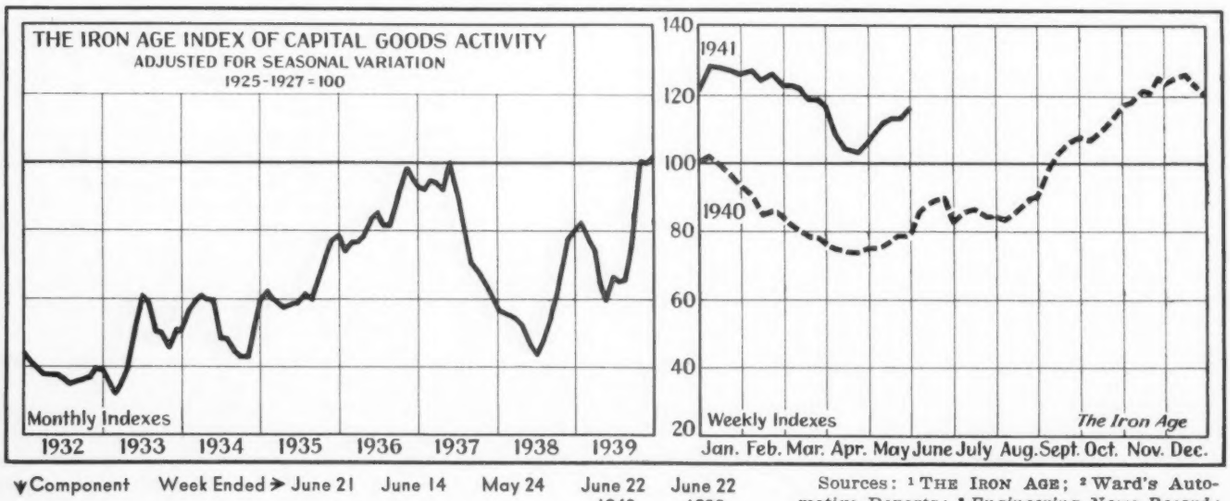
The record set by construction awards for the week was due entirely to public activity, private lettings showing a decline. The week's awards totaled $173,306,000, or 24 per cent above the preceding week.

Ingot Rate Rises ½ Point to 100.5%


STEEL INGOT PRODUCTION
(OPEN HEARTH AND BESSEMER)
PER CENT OF CAPACITY
Monthly Production
1932 1933 1934 1935 1936 1937 1938 1939
1941
1940
Weekly Production
The Iron Age
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
100 90 80 70 60 50 40 30 20 10 0

District Ingot Production, Per Cent of Capacity	Pitts-burgh	Chicago	Valleys	Phila-delphia	Cleve-land	Buffalo	Wheel-ing	Detroit	Southern	S. Ohio River	West-ern	St. Louis	East-ern	Aggre-gate
Current Week ..	100.0	103.5	100.0	97.5	97.0	104.5	90.0	105.5	95.0	106.0	102.5	111.0	97.0	100.5
Previous Week..	100.0	102.0	99.0	97.5	97.0	104.5	85.0	109.0	95.0	103.5	102.5	111.0	101.5	100.0

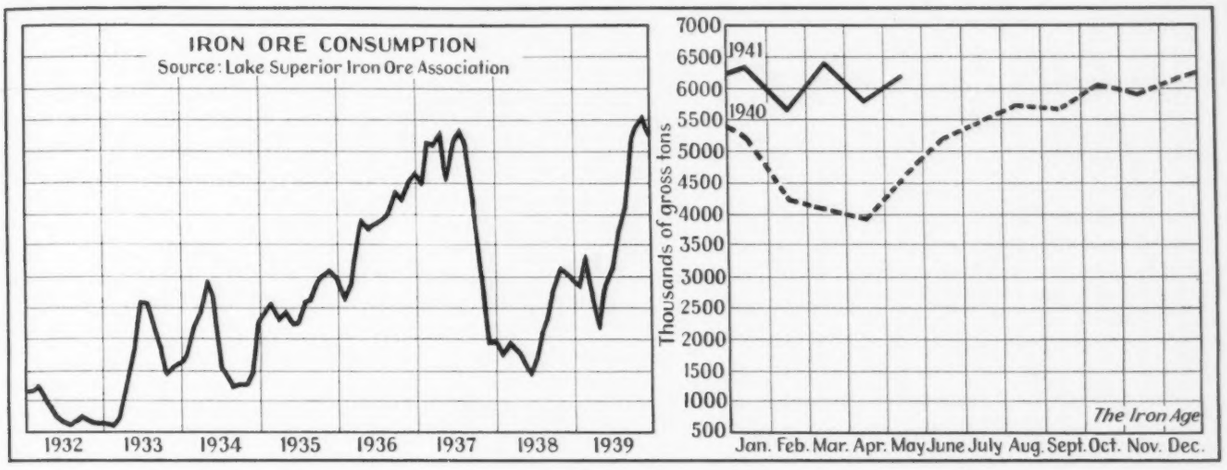
New Plant Building Boosts Index


THE IRON AGE INDEX OF CAPITAL GOODS ACTIVITY
ADJUSTED FOR SEASONAL VARIATION
1925-1927 = 100
Monthly Indexes
1932 1933 1934 1935 1936 1937 1938 1939
1941
1940
Weekly Indexes
The Iron Age
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
140 120 100 80 60 40 20

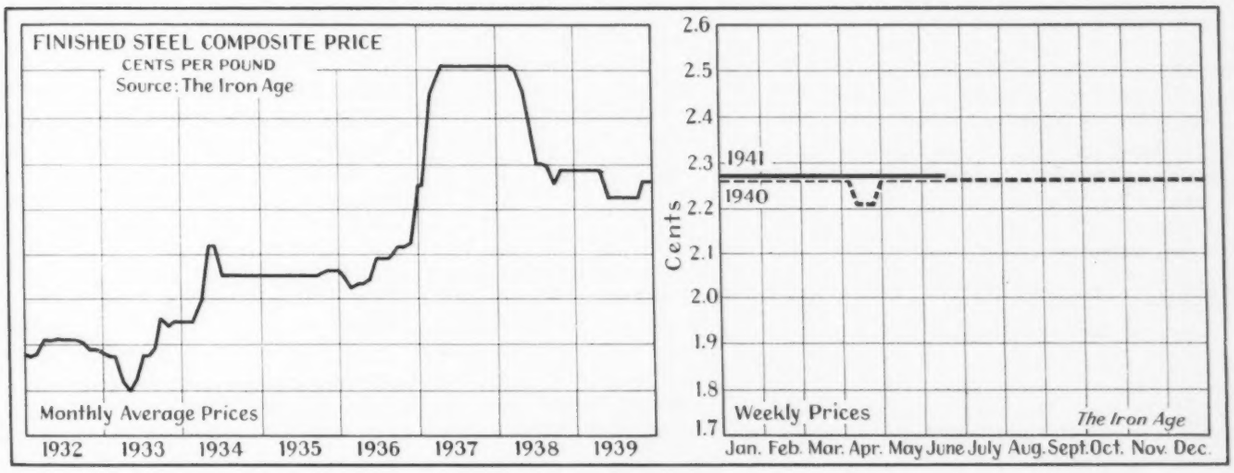
Component — Week Ended →	June 21	June 14	May 24	June 22 1940	June 22 1929
Steel ingot production[1]	145.3	143.7	136.1	126.9	137.0
Automobile production[2]	121.8	120.6	114.3	82.0	135.2
Construction contracts[3]	118.9	111.7	112.9	70.2	122.2
Forest products carloadings[4]	75.9	75.2	73.2	61.2	122.2
Pittsburgh output and shipments[5]	130.1	125.5	127.8	101.8	128.4
COMBINED INDEX	118.4	115.3	112.9	88.4	129.0

Sources: [1] THE IRON AGE; [2] Ward's Automotive Reports; [3] *Engineering News-Record*; [4] Association of American Railroads; [5] University of Pittsburgh. Indexes of forest products carloadings and activity in Pittsburgh area reflect conditions as of week ended June 7. Other indexes cover week of June 14.

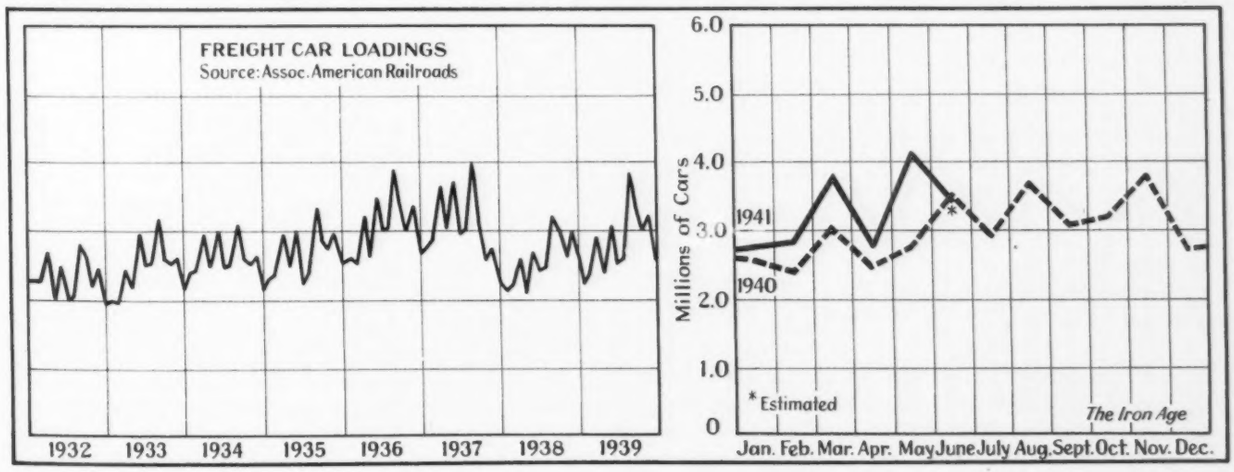
Iron Ore Consumption Gains in May



Steel Composite Price Unchanged for 14 Months



June Freight Car Loadings Expected to Ease



Market News

. . . THE WEEK'S ACTIVITIES IN IRON AND STEEL

New Business

. . . Non-defense steel users to be pinched severely

An interpretation of average figures at PITTSBURGH indicates that purely non-defense consumers are likely to be pinched much tighter than generally believed. Assuming that several of the large companies are booking orders at a rate from 130 to 140 per cent of actual production and assuming that current bookings represent approximately 50 per cent for British and American direct defense as well as indirect defense items, this would leave between 65 and 70 per cent of current production earmarked for preferential treatment.

Figures which indicate the per cent of defense orders already on the books, as well as the per cent of the total current bookings which represent defense needs, are misleading inasmuch as curent bookings are somewhat above actual production. Furthermore, preferential treatment is being granted ahead of commercial needs whether the latter represent old orders or fresh ones.

Following the allocation by the Treasury Department of about 411,000 tons of ingots and semi-finished material and 51,000 tons of finished steel products among various steel companies for British needs, action is expected soon on sending out of bids for the balance of the 1,000,000-ton requirement. Deliveries on the 462,000 tons just allocated are slated for July or by pre-arrangement with the British Purchasing Commission. The amount of steel now on hand at Eastern ports and the availability of bottoms will determine the tonnage to be shipped throughout July. No official reason has been forthcoming from Washington as to why the entire 1,000,000 tons required by the British is a four-month period was not allocated at one time.

Mandatory priorities on all alloys by July 1 are foreseen at CLEVELAND. It is expected the same procedure and sequence of events will be followed as in the case of nickel. Most alloys have been under terrific demand, perhaps the tightest being low carbon ferrochrome and the easiest molybdenum.

By August it is expected priorities will be a necessity for consumers of nearly all types of iron and steel. In ordering steel recently under priorities, some Ohio makers of defense equipment have been requested by steel mills to relinquish an equal amount of non-defense tonnage previously placed on mill books.

Extra heavy demand for semi-finished steel from plate bar and pipe mills in OHIO probably will unbalance the output at some of the present production centers. Certain departments may be barely operating and some mills may be asked to relinquish semi-finished.

Liberalization of the steel price schedule, announced June 22 by Leon Henderson, lessens the amount of freight absorption required of mills in order to reach some areas in which important defense work such as shipbuilding is going on.

Orders at Chicago for June are generally about even or lagging slightly behind May. Some mills are from 10 to 15 per cent behind the previous month. New orders bearing strict priorities are sharply on the increase, industry there figuring that the proportion is well above 50 per cent.

Bookings at BIRMINGHAM are estimated to be exceeding those for the corresponding period in May by 20 to 25 per cent and orders in May reached a record mark. The problem of supplying domestic customers in the face of tremendous demand for national defense purposes is becoming increasingly acute.

Steel Operations

. . . Rate rises above 100% for first time this year

According to estimates by THE IRON AGE, ingot production this week has risen to 100.5 per cent, the first time this year that it has passed 100 per cent. This is slightly higher than the estimate of the American Iron and Steel Institute on Monday, which was 99.9 per cent, the difference being accounted for by the fact that THE IRON AGE estimates include some plants not included in the institute estimate.

A rise of a point and a half at Chicago to 103.5 per cent partly accounts for the higher average rate this week, but there has also been a gain of one point to 100 per cent in the Youngstown area, one of five point in the Wheeling-Weirton district to 90 per cent and one of two and a half points in southern Ohio to 106 per cent. Only five of the 13 districts for which calculations are computed by THE IRON AGE are estimated to be operating at less than 100 per cent and all of these but one are at 95 per cent or above.

Prices

. . . OPACS issues order clarifying steel price ceiling regulations

The Office of Price Administration and Civilian Supply on June 21 issued an order amending price schedule No. 6, which established ceiling prices on iron and steel prices. The long-awaited clarification of the steel price ceiling is interpreted in an article on another page of this issue. A change in the export price setup is explained in detail under the heading "Export Trade" in the market section of this issue.

Pig Iron

. . . Possibility of mandatory priorities becomes stronger

Carnegie-Illinois Steel Corp. last week blew in an additional blast furnace at its Clairton works, giving this company 22 out of 25 furnaces in blast in its Pittsburgh area and 11 out of 11 in the company's Youngstown works. According to reports, two older furnaces at Carnegie-Illinois' Edgar Thomson works, which are not carried on the active list, may be moved to Utah if expansion programs for that location now under consideration materialize. Jones & Laughlin Steel Corp. is expected to have relining operations completed soon on one of its Eliza works furnaces which has been out of blast for

some time. Reports are circulating that the installation of "dry blast" equipment on one of Jones & Laughlin's Aliquippa works blast furnaces had yielded an increase in production and has enhanced the quality of the iron. The company has under consideration plans for placing air conditioning equipment on another of its units.

At YOUNGSTOWN all blast furnaces were operating early this week following resumption of a Republic stack which had been down for repairs.

Pig iron for ballast has been bought recently by the U. S. Navy. Several hundred tons of high phos charcoal pig iron were sold by a Michigan furnace for this purpose.

Scrap continues to hold the key to a large share of the pig iron picture at present, reports CLEVELAND. Inability to obtain all the scrap desired has forced a number of melters to increase their pig iron ratio materially.

Possibilities of mandatory priorities on pig iron are becoming stronger week by week, according to some leading sellers. Most major foundries now hold preference ratings and others are scheduled to obtain them soon.

Iron Ore

. . . Mine near Watertown, N. Y., being considered by Pittsburgh company

Possibilities of obtaining ore from the Benson properties near Watertown, N. Y., are reported being studied by a Pittsburgh steel maker, according to a report originating at CLEVELAND.

Semi-Finished Steel

. . . British allocations add to pressure on mills

Semi-finished steel equipment will be strained to the utmost as mills will be compelled to rush immediate production of at least a part of the 411,000 tons of ingots and semi-finished material allocated for the British last week. Delivery is called for by July 31 or on schedules set up by the British Purchasing Commission. An expansion in steel ingot production must of necessity include an increase in blooming and slabbing capacity in the industry as current equipment is now working at top speed.

Expansion of production facilities, contemplated or already under way at numerous major steel production centers, includes improvements to the billet mill of Republic Steel Corp. at South Chicago.

Wire Products

. . . Order jam delays deliveries of rods and wire

Wire sellers and producers at CLEVELAND are on more of a day-to-day basis in all respects than ever before. While the biggest jam for some time has centered on rods due to the fact that mills' own operations are up so sharply, now shipments of drawn wire to the commercial trade are frequently delayed unavoidably.

Sheets and Strip

. . . Commercial users, including automobile companies, feeling pinch

Automobile concerns are finding some of their deliveries being pushed back because of urgent national defense priorities and this tendency is expected to be accentuated greatly in the near future. According to PITTSBURGH reports, some wide strip mills are operating more than 50 per cent on plate tonnage. With steel supplies being stringently allocated within companies and with national defense sheet requirements increasing, commercial sheet users are already feeling the pinch. Some manufacturing plants have been forced to periodically curtail production because of lack of supplies.

About 20 per cent reduction in automotive shipments has been invoked by principal producers in CHICAGO. The huge Ordnance Department inquiry for 16 to 32 million sheet frames for ammunition packing cases will involve over 10,000 tons of sheets.

With more and more tonnage going to the defense program and the railroads, some flat rolled units at CLEVELAND are unable to maintain full operations because of a jam on slabs. So far, however, shipments to the leading regular customers of CLEVELAND mills have not been seriously affected.

With defense orders taking an increasing proportion of sheet steel output in the Southern Ohio district, available material for normal consumption is rapidly diminishing. These latter users are beginning to feel the pinch of the "all out" defense program and mill interests report steady pleas for sheets. Third quarter rationing that had been set up and which was thought to be adequate has been virtually discarded as proportional figures have been steadily reduced.

Owing to a lack of steel resulting from the idleness of No. 2 blast furnace at Ensley steel works, operations at the sheet mill of the Tennessee Coal, Iron & Railroad Co., Birmingham, are being curtailed.

Structural Steel

. . . Awards are 27,500 tons . . . Inquiries 18,950 tons

Fabricated structural steel awards total 27,500 tons this week. Outstanding lettings are 9000 tons for dry docks Nos. 5 and 6 at the Brooklyn Navy Yard; 3650 tons at Rock Island, Ill., for an arsenal warehouse; 2715 tons for three hangars at Wright Field, Dayton, Ohio; 1700 tons for a Navy storage building at Oakland, Cal.; 1005 tons at Augusta, Ga., for 10 arsenal warehouses; 1000 tons at Milwaukee for the Falk Corp. expansion, and 1000 tons at Tonawanda Township, N. Y., for the Linde Air Products building.

New structural steel projects of 18,950 tons are lower than a week ago.

Tubular Goods

. . . 24-in. line from Texas to Atlantic Coast may go through

Latest reports on the 24-in. line to run from Texas to the East Coast are that the project will stand as originally designed instead of being broken into two 12-in. lines. Even this plan, however, is subject to change. Oil companies are anxiously putting on pressure for oil casing and tubing, despite assurances from steel companies that there is no need for hysteria. Some pipe makers are sold out for the remainder of the year on line pipe and are turning down fresh inquiries.

Heavy demand persists in all products and particularly in electric weld divisions.

Painting is being urged as a substitute for galvanizing.

Steel Export Prices

• • • Following are maximum allowable prices for principal steel export items, as established by OPACS in revised price order of June 21, 1941. Prices are base quotations of United States Steel Export Co., f.a.s. principal ports, in effect on April 16.

	Boston, New York, Philadelphia, Baltimore, Norfolk	Charleston, Savannah, New Orleans, Mobile	Galveston, Houston	San Francisco, Seattle, Portland, Los Angeles (San Pedro)
PER GROSS TON				
Ingots	$37.00	$37.00	$39.49	$46.60
Blooms, billets, slabs, sheet bars	42.00	42.00	44.49	51.60
Forging billets	48.00	48.00	50.49	57.60
Wire rods in coils	52.00	52.00	54.49	61.60
Light rails (60 lb. and under)	52.50	52.50	58.01	62.21
Heavy rails (over 60 lb.)	54.15	54.15	59.66	63.86
Girder rails	55.00	58.55	60.25	64.27
PER 100 POUNDS				
Angle splice bars for heavy rails	$3.52	$3.52	$3.64½	$3.92
Tie plates	2.92	2.92	3.04½	3.32
Track spikes	3.25	3.25	3.37½	3.65
Axles	3.38	3.58	3.66	3.78
Skelp	2.20	2.40	2.48	2.60
Filing	2.60	2.80	2.88	3.00
Plates (carbon steel)	2.45	2.45	2.57½	2.85
Structural shapes (standard)	2.45	2.45	2.57½	2.85
Merchant bars and bar mill shapes	2.45	2.45	2.57½	2.85
Concrete bars (new billet)	2.45	2.45	2.57½	2.85
Cold finished carbon steel bars	2.88	3.08	3.16	3.28
H. R. alloy bars	2.79½	3.04	3.04	3.14
Cold finished alloy bars	3.56	3.69	3.69	3.79
H.R. carbon tool steel bars (Tennessee Special)	7.57	7.57	8.37	7.50
Black annealed wire	3.10	3.30	3.38	3.50
Galvanized plain wire	3.60	3.80	3.88	4.00
Galvanized barb wire	3.65	3.85	3.93½	4.07½
Bright nail wire	2.80	3.00	3.08	3.20
Wire nails	2.85	2.85	2.98½	3.29
Galvanized staples (incl. $1.17 extra for galv.)	3.90	4.12	4.21	4.34
Bright staples (in. 72c. extra for bright)	3.50	3.72	3.81	3.94
PER BASE BOX				
Tin plate 14"x20" 107 lb.-112 sheets, wooden boxes—wire strapped	$5.35	$5.35	$5.49	$5.80
PER 100 POUNDS				
Hot rolled sheets, 24 B.G. plain bundles (includes 90c. for gauge)	$3.25	$3.25	$3.37½	$3.65
10 U. S. G. plain bundles	2.35	2.35	2.47½	2.75
Cold rolled sheets, 17 U.S.G. in 2-ton metal crates (includes 15c. for packing)	3.40	3.60	3.68	3.80
Galvanized sheets, 24 B.G. in plain bundles	3.90	3.90	4.02½	4.30
Hot rolled strip	2.40	2.60	2.68	2.80
Cold rolled strip	3.10	3.30	3.38	3.50
American standard pipe, black, T.&C. 1" to 3"	67%	65%	64.2%	63%
American standard pipe, galvanized, T.&C. 1" to 3"	56.2%	54.2%	53.4%	52.2%
American extra strong pipe, black, plain ends 1" to 3"	65.5%	63.5%	62.7%	61.5%
American extra strong pipe, galvanized, plain ends 1" to 3"	55.7%	53.7%	52.9%	51.7%
American double extra strong pipe, black, plain ends 2" to 2½"	53.8%	51.8%	51.0%	49.8%
American double extra strong pipe, galvanized plain ends, 2" to 2½"	43%	41%	40.2%	39%
English gas tubes, black, T.&C. ⅜" to 6"	67%*	65¼%*	64.5%*	63.5%*
	65%**	63¼%**	62.5%**	61.5%**
English gas tubes, galvanized, T.&C. ⅜" to 6"	59%*	57¼%*	56.5%*	55.5%*
	57%**	55¼%**	54.5%**	53.5%**
English steam tubes, painted, T.&C. ⅜" to 6"	62%*	60¼%*	59¼%*	58.5%*
	57%**	55¼%**	54½%**	53.5%**
English steam tubes, galvanized, T.&C. ⅜" to 6"	50%*	48¼%*	47½%*	46.5%*
	49%**	47¼%**	46½%**	45.5%**

* South American markets.
** Other markets.

Discounts—American standard pipe—off American list No. 6.
English gas tubes—off English list No. 3, converted 2c. to the penny.

Export Trade

. . . OPACS announces prices to govern sales of steel abroad

The revised schedule of steel prices issued on June 21 by OPACS gives sellers an option of either of two methods of pricing export sales. One is to use the export prices of the United States Steel Export Co. (see accompanying table), or to use the basing point price at the governing basing point, plus export extras, plus export transportation charges from the governing basing point to the place of delivery as customarily computed. In the case of c.i.f. sales, adjustments for additional transportation and insurance charges may be made in computing export prices by either method. For specialty products for which there are no basing point base prices and extras or United States Steel Export Co. f.a.s. seaboard quotations, the ceiling prices are the prices and extras which would have been charged on April 16, exclusive of any premiums or charge for advanced delivery or any other inducement offered by the buyer or requested by the seller.

On the basis of present interpretations of the new export price ruling, it is believed that inland mills will probably use the basing point plus transportation costs method in establishing export quotations, while mills located on or near the coast will use the prices of the United States Steel Export Co.

Bolts, Nuts and Rivets

. . . Makers encountering difficulties in getting steel

Producers at CLEVELAND encountered stricter limitations on raw material last week. Operations in most departments still continue up to the limit of incoming steel but frequently delays are suffered in meeting delivery promises to commercial accounts. In order to get alloy rods for a priority tank job, one producer had to cancel with the steel mill an equal amount of previously placed tonnage. Even then the best delivery promise was a month later than hoped for.

About 8,000,000 bolts and nuts, involving around 5000 tons, are up in CHICAGO for shell packing cases, bids closing June 24. The bolts alone weigh close to 1 lb. each.

Reinforcing Steel

. . . Awards total 13,255 tons, new jobs 11,625 tons

Reinforcing steel awards tota 13,255 tons. The largest lettings are 1500 tons for a dry dock at Bayonne, N. J.; 1000 tons for the Portsmouth Navy Yard, Portsmouth, N. H.; 1000 tons for 13 shipways and ship building facilities at Baltimore; 1000 tons for an acid plant at Alton, Ill., for the Monsanto Chemical Co., and 1000 tons at Houston, Tex., for the Treasury Department.

New reinforcing steel projects of 11,625 tons include 2500 tons at Kingsbury, Ind., for an addition to an ammunition plant; 2500 tons at Burlington, Iowa, for an ammunition plant addition; 1800 tons for a housing project at Charleston, Mass.; 1400 tons for the Wolfe Creek Dam, Jamestown, Ky., and 1072 tons for a state highway viaduct at North Sacramento, Cal.

Railroad Buying

. . . Orders placed for 12,000 cars, 160,000 tons of rails

Orders this week amount to 12,000 freight cars, 160,000 tons of rails and 12 locomotives, while inquiries for 2600 freight cars and over 12 locomotives are reported in addition to the 500,000 tons of rails on which conversation has been had between rail mills and railroads, and which was reported in THE IRON AGE several weeks ago, quantities ranging from 150,000 to 200,000 tons have been in the conversational stage recently. It is expected that the 1942 rail program will run between 1,250,000 and 1,500,000 tons and initial rollings will begin in the last quarter of this year.

Great Northern is to spend $48,500,000 in 1941 as follows: 4000 freight cars were ordered of which half have been delivered. In company's shops 15 N-3 type steam locomotives are being built, while Baldwin Locomotive Works and Electro-Motive Corp. are constructing 18 diesel-electric engines, mostly 1000-hp. units, but including two of 4050 and one of 2700 hp.

Pennsylvania's new equipment purchases total $23,000,000. The road has ordered 150,000 tons of rails: 75,000 from Carnegie-Illinois, 66,000 from Bethlehem and 9000 from Inland Steel Co. In own shops it will build 3000 hoppers, 2000 box cars, 1000 gondolas, 10 flat and 10 well cars, 50 cabooses, also 15 electric passenger and freight locomotives and 12 steam engines.

Other recent orders include: Chesapeake & Ohio, 1000 hoppers to American Car & Foundry Co. and 1000 box cars to Pullman-Standard Car Mfg. Co.; New York Central, 1000 box, 500 gondola cars to Despatch Shops, Inc.; Chicago & Eastern Illinois, 500 box cars to Mt. Vernon Car Mfg. Co.; Central of Georgia, 150 auto box cars to American Car & Foundry; Canadian National, 10 4-8-4 locomotives to Montreal Locomotive Works; Reading, 7000 tons, and Lehigh & New England 1725 tons of rails to Bethlehem Steel Co.

The Army has ordered four 70-ton flat cars from Greenville Steel Car Co. and is asking bids for 68 ammunition and 29 fire control cars. The Navy bought two diesel-electric switches from General-Electric and is asking for bids on two others.

Among pending inquiries are: Delaware, Lackawanna & Western, 1000 freight cars; Central of New Jersey, between 500 and 1000 gondolas; St. Louis Southwestern, 500 freight cars; Central of Vermont, 50 box cars; New York, Susquehanna & Western, eight diesel-electric locomotives; Florida East Coast, several diesel-electric engines under contemplation.

Merchant Bars

. . . Growth of preference business crowds out other orders

With a fair proportion of unfilled tonnage now on order books getting preferential treatment and with incoming business representing an increasingly larger share of national defense requirements, the plight of the non-defense bar user is anything but rosy, according to PITTSBURGH reports.

While defense shipments from CLEVELAND mills are gaining and frequently represent the largest share of weekly deliveries, railroad requirements, agricultural implement makers and the automobile industry continue to be represented prominently.

Refractories

. . . Price advances averaging $4 per 1000 brick put into effect

Makers of refractories recently announced price advances averaging about $4 per 1000 brick. No statement has come from the Price Administrator in Washington as to whether these higher prices will be permitted to stand, but an indictment was filed last week against three of the leading makers alleging violation of the anti-trust laws.

Refractory makers assert that costs have risen sharply, principally through the 10c per hr. wage advance granted recently. The wage advance alone, it is stated, adds $4 to the cost of producing 1000 brick in the case of some makers.

Tin Plate

. . . Needs for defense and Britain are growing

Cold reduction tin plate mills are running at more than 100 per cent of rated capacity and tin plate backlogs, including British tonnages, are heavy enough to insure this rate for some time to come. Some can companies and tin plate makers are showing anxiety regarding requirements for uses other than direct and indirect defense. Tin plate needs for British and American defense purposes, as well as strategic non-defense uses, are growing at an accelerated rate and this trend is expected to continue.

Plates

. . . Ship, railroad and British orders push back commercial deliveries

Commercial plate requirements were pushed back further again this week with the allocation of freight car tonnage, as well as some British requirements. High-speed mills are already being taxed to the utmost in the production of plates and a revision of the OPACS steel price order whereby the governing basing point can be that basing point nearest the point of production is expected to result in a much larger tonnage of plates for West Coast consumption being made in the East.

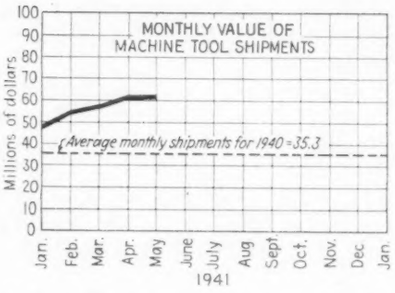
Machine Tools

. . . SALES, INQUIRIES AND MARKET NEWS

Priority Shifting a Headache

Cincinnati

• • • **The machine tool market** in this area continues to be, as one manufacturer put it last week, a "headache." Shifting of priorities continues to be a bugbear, to such an extent that machine tool manufacturers are never certain that they have got a correct priority on a particular tool until it is shipped and erected in the purchaser's plant. Hope continues to be expressed, however, that the decentralization of the priorities office will bring sufficient authority as to relieve some of the present confusion. Orders continue to flow into the market in heavy volume, and the reservoir of potential business is still large. Propositions for tooling a large bomber plant continue to be discussed.



Machine tool shipments for May are estimated at $60,800,000 as compared to $60,300,000 for April and $57,400,000 for March. Shipments for May a year ago were estimated by the National Machine Tool Builders Association at $32,800,000.

Automotive manufacturers are also in the market. Forward commitments extend now well into the middle of 1942, with some into the third and a few into the fourth quarter of that year.

Shipments Gain Slowly

Cleveland

• • • **Machine tool shipments** for May at $60,800,000 showed a fair gain over the $60,300,000 reported by the National Machine Tool Builders Association for April. It is expected the monthly figure soon will show more benefit from the industry's widespread expansion.

Champion Machine & Forging Co., Cleveland Pneumatic Tool Co., Warner & Swasey Co., and the Aluminum Co. of America have been in the market more actively here recently. At Toledo principal interest centers around the new American Propellor Corp. plant, granted a government loan of approximately $7,500,000 last week.

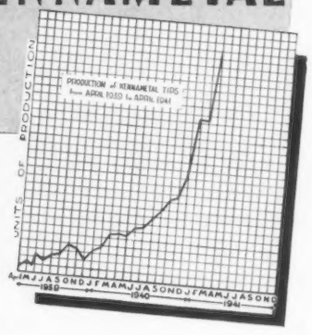
Bomber Program Huge

Chicago

• • • **Milling machine manufacturers** received word last week that 7000 millers would be needed for the four engine bomber program—all needed by July, 1942. Builders feel confident that they will be able to meet the bill. Actually, the impact of the tremendous aircraft program has not been felt in orders yet. But calling of manufacturers to Washington by types of machines built is expected to result in a flood of orders very soon. Lathe manufacturers here who have been producing shell turning equipment have been requested to release this equipment for aircraft needs. This probably means that the industry will be asked to build single purpose machines for shell turning.

Aiming for installation of equipment in September or earlier the Buick aircraft engine plant is receiving machine tools for a "pilot line." Doubling of Buick's original output has practically doubled its tool requirements. Studebaker, with three engine plants going up in this area, is not as far along and equipment for even the pilot line is not yet in sight.

PRODUCTION OF KENNAMETAL MULTIPLIED 50 TIMES IN TWO YEARS



and will be more than DOUBLED by October 1941

KENNAMETAL was first put into commercial production in the spring of 1939. The demand for this superior steel cutting carbide increased so rapidly that by April, 1941, fifty times more grams of KENNAMETAL were produced than in April, 1939.

The widespread use of KENNAMETAL in armanent production has placed even heavier demands on our production facilities. In order to make as prompt deliveries as possible in the present emergency, we are enlarging our equipment and personnel to double our present production by October of this year.

Standard KENNAMETAL blanks are now being shipped within three to four days upon receipt of order; standard and modified standard tools within ten days (except for unusually large order involving thousands of tools). Write for Catalog 41 listing specifications and prices of standard tools and blanks.

Style 11 Tool
Tungsten Concentrated Where Needed

The tungsten in KENNAMETAL tools is concentrated entirely in the hard carbide tip. Each pound of tungsten used in KENNAMETAL tools does as much work as 60 pounds of tungsten in high speed steel tools.

McKENNA METALS Co.
144 LLOYD AVENUE
LATROBE, PENNSYLVANIA, U.S.A.

Non-Ferrous Metals

. . . MARKET ACTIVITIES AND PRICE TRENDS

New York, June 24—Chief interest in the non-ferrous markets continues to center on the supply problem, as questions of prices are largely academic. Outstanding developments of the past week was announcement that the July zinc pool would be 22 per cent of May slab production, or about 16,000 tons, and that the Metals Reserve Co., the government agency for buying strategic materials, has bought 100,000 tons of zinc concentrates from Compania Mineria Aguilar, S.A., of Argentina. The South American company is reported to be 90 per cent owned by St. Joseph Lead Co.

Although the zinc pool percentage for July is unchanged from June, the higher refined output in May will result in about 1000 tons more being placed in the July pool. In addition to the slab pool, zinc oxide producers will set aside 10 per cent of their May production, or 1500 tons, for emergency use in July.

The concentrates purchased from Argentina, marking the second ore purchase by the MRC, the first having been 50,000 tons from Newfoundland, is estimated to be equal to about 42,500 gross tons of recoverable zinc. St. Joseph Lead Co. has apparently been endeavoring to move the Argentinian ore to this country but the tightness in shipping space has prevented it from moving sufficient amounts. Assumption of the task by the government agency is designed to expedite this movement.

Marketwise, the situation is little changed, with non-defense users of zinc finding it increasingly difficult to obtain adequate supplies. Prices remain unchanged at 7.25c. a lb., East St. Louis, and 7.65c., New York.

Lead

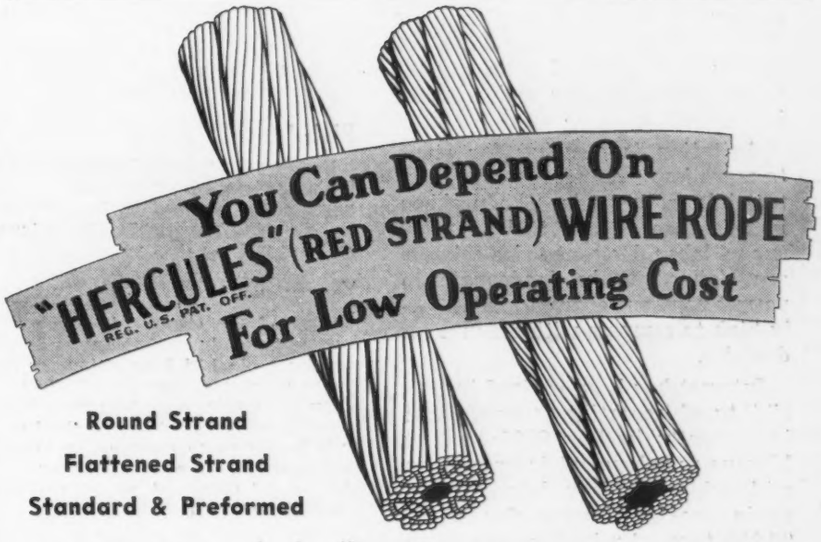
Record shipment of 69,382 tons of refined lead in May forced a further reduction of 8881 tons in stocks to a new low of 34,018 tons. The present stock total consists of 4938 tons of antimonial metal and 29,080 tons of pig lead. While data on shipment of foreign material are not available for May, it is estimated that total deliveries to domestic consumers, including foreign metal, were in the neighborhood of 85,000 tons. Refined production in May amounted to 60,509 tons, as compared with 56,086 tons in April and 62,048 tons in January, the latter being the highest production figure in recent years. Day-to-day demand for lead continues at a high rate with prices holding unchanged at 5.70c., St. Louis, and 5.85c., New York.

Copper

Allocations for June from the emergency pool were released on Saturday, and shipment of this emergency metal is already underway. The OPM order to release the June pool affected only the 12c. portion of the supply, decision on that portion taken from smelters at 12.50c. apparently not having been reached yet. Meanwhile discussions concerning brass and copper scrap price ceilings are underway and establishment of maximums for these items is expected momentarily. Allocation continues to be the rule in the red metal market, with prices holding unchanged. Producers are quoting 12c. a lb., Connecticut Valley, and smelters 12.50c. A small business in bonded copper was done in the past week at 11c. f.a.s., New York.

Tin

Action taken last week by the government to bar all private rubber imports, gave rise to apprehension among tin users that a similar move might be made in tin imports. Previous to Saturday, tin buying was moderately active.



WHY not let "HERCULES" (Red-Strand) Wire Rope help you meet present day production requirements and still maintain a reasonable margin of profit? You will quickly discover that "HERCULES" is a dependable ally—not only in today's fight against increasing operating costs—but also in your endeavor to speed up production.

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Scrap . . . MARKET ACTIVITIES AND QUOTATION TRENDS

While it is still too early to appraise fully the influence of the latest revisions in the scrap price schedule, the general opinion is that they will have little, if any, effect in alleviating the present serious shortage. While the bulk of the revisions is considered as desirable, the regulations governing No. 1 and No. 2 dealers' bundles are still a source of complaint from scrap dealers as being contrary to long accepted trade practice. Doubt is also expressed that the provisions for use of remote material are sufficiently broad to encourage the movement of large amounts of this type of scrap.

Meanwhile, the movement of scrap is still substantially below consumption and such stock piles as exist are being rapidly depleted. Serious repercussions in ingot production rate are expected shortly if scrap receipts are not stepped up sharply. Adding to the present supply deficit is the fact that mills are unable to make any headway toward building up stocks for the winter when seasonal influences reduce scrap collecting and processing operations.

Agitation is growing for steps to move large tonnages held in automobile graveyards. The problem in this case is said to be largely one of labor. Present price ceilings are claimed to be inadequate to permit payment of wages sufficiently high to compete with defense industries.

Interest has been revived in possibility of importing scrap. A boat is currently loading 2500 tons at Havana for shipment to an eastern mill, while Mexican interests are again seeking buyers for about 90,000 tons of miscellaneous scrap said to be available in that country.

Newport, Ky., previously a basing point, has been omitted from the new schedule and consequently will take the price of the nearest basing point, with adjustments for freight. Newport is officially considered to have been a basing point up to June 18.

A conflict of opinion between the Treasury and OPM is credited with causing a delay in allocation of exports for Great Britain. OPM is said to be opposed to export shipments when domestic mills are running short.

(See opposite page for details of revised scrap price schedule)

Pittsburgh

Although OPACS's latest revision in the scrap price order allows Pittsburgh interests to go beyond points carrying a freight rate of more than $11.20, this district is still unable to draw upon certain Southern and Southwest areas which heretofore furnished supplies to this area. Conditions, therefore, are not changed to any great extent from those which existed prior to the revision. In other words, certain points in the South and Southwest which furnished a substantial supply of scrap here in the past years are in a "twilight" zone which is too far for the $1 a ton springboard freight allowance and not far enough to come under the classification of remote scrap.

Chicago

Scrap situation here continues unchanged with problem of getting materials still paramount. Machinery cast is still very scarce as are some other foundry items. Brokers and dealers are scouring potential sources of supply which are diminishing not only because of heavy demand but also because many normally engaged in collecting have found other pursuits more profitable.

Philadelphia

Recent adjustment of scrap prices and basing points is not expected to have much effect on trading here. It does, however, eliminate selling No. 2 bundles at No. 2 melting steel price.

Youngstown

Some of the changes in scrap prices represent exactly what the scrap industry and its trade had been doing for three weeks previously. Despite the fact that scrap has been moving here from Indiana recently, the total amount received weekly is hardly up to consumption. District consumers still are able to draw material out of Cleveland at 7c. under the maximum allowed.

Cleveland

Flow of material here is reported considerably below normal, as much as 40 per cent off. The change whereby new dealer bundles are $1 under No. 1 steel has aroused universal disfavor among dealers since factory bundles still are equal to No. 1. Another subject of complaint here is the price on stove plate, which is said to be too low.

Cincinnati

Recent revision of price ceilings to Portsmouth, Middletown and Ashland has given some relief to the district market, in that scrap dealers are able to keep the available material produced in this area within the district, but has not been sufficient to attract enough material from other areas to supply needs here.

Buffalo

Thousands of tons of scrap which have come down the Lakes from Detroit and Duluth this season are being consumed rather than consigned to reserve stockpiles for the fall and winter as intended. However, dealers claim shipments to mills now are heavier than ever before for this time of year.

St. Louis

With the elimination of Peoria and Kansas City as basing points, which dealers contended worked against St. Louis, the situation here has clarified. Railroad lists are light. One was out last week, and none this week, indicating they are either withholding their supplies or selling direct to consumers.

Detroit

Ford Motor Co. came into the market last week for a substantial tonnage of open hearth scrap. Although steel for auto production will soon be curtailed, Ford will probably make plates for cars and ships, which may account for its scrap inquiry at this time.

Boston

Movement of scrap by barge to eastern Pennsylvania continues fairly heavy, **with the trade more interested** in such shipments than in those to other points. Elimination of basing points has failed to increase the movement of heavy melting steel. The elimination does not affect the American Steel & Wire Co. as it has been buying on an f.o.b. basis with Washburn Wire. However, No. 1 steel at $14.06 f.o.b. and No. 2 at $13.06, means 70c. a ton less to consumer.

Birmingham

Cast grades have started to move into this district again following price revision of last week. Under the former schedule, cast grades originating at Birmingham could be sold at Chattanooga and other points at a better price than could be obtained here.

New York

It is conservatively estimated that scrap deliveries in June are 10 to 15 per cent under those of May. Dealers complain that the new regulations have left their pleadings for a price for No. 1 bundles equal to No. 1 steel unheeded. They also fear that more plants will install bundling presses and deprive the dealer of his livelihood. Considerable quantities of scrap have been moved out of up-state New York for shipment to Canada. New York subway system will sell 1500 tons of rails and 1500 tons of unassorted materials on the 30th.

Maximum Iron and Steel Scrap Prices

As Revised by OPACS June 18, 1941

SCHEDULE A

Iron and Steel Scrap, other than Railroad Scrap

(Basing point prices from which shipping point prices and consumers' delivered prices are to be computed—Dollars per gross ton)

Basing Points → / GRADES ↓	Pittsburgh Johnstown, Pa. Weirton, W. Va. Steubenville, O. Youngstown Warren, O. Sharon, Pa. Canton, O.	Chicago	Kokomo, Ind.	Bethlehem, Pa. Claymont, Del. Coatesville, Pa. Phoenixville, Pa. Harrisburg	Sparrows Point, Md.	Buffalo	Cleveland	Toledo, Ohio	Portsmouth, Ohio Middletown, Ohio Ashland, Ky.	St. Louis	Detroit	Duluth	Birmingham, Ala.	Chattanooga, Tenn.	Radford, Va.	Worcester, Mass. Bridgeport, Conn. Philipsdale, R. I.	Los Angeles San Francisco Seattle	Minnequa, Colo.
No. 1 heavy melting	20.00	18.75	18.25	18.25	18.75	18.75	19.25	19.50	.....	19.50	17.50	17.85	18.00	17.00	.....	.....	.....	14.50	16.50
No. 1 hydraulic compressed black sheet	20.00	18.75	18.25	18.25	18.75	18.75	19.25	19.50	.....	19.50	17.50	17.85	18.00	17.00	.....	.....	.....	14.50	16.50
No. 2 heavy melting	19.00	17.75	17.25	17.25	17.75	17.75	18.25	18.50	.....	18.50	16.50	16.85	17.00	16.00	.....	.....	.....	13.50	15.50
Dealers' No. 1 bundles	19.00	17.75	17.25	17.25	17.75	17.75	18.25	18.50	.....	18.50	16.50	16.85	17.00	16.00	.....	.....	.....	13.50	15.50
Dealers' No. 2 bundles	18.00	16.75	16.25	16.25	16.75	16.75	17.25	17.50	.....	17.50	15.50	15.85	16.00	15.00	.....	.....	.....	12.50	14.50
Mixed borings and turnings	15.25	14.00	14.25	13.50	14.00	14.00	14.50	14.75	.....	14.75	12.75	13.10	.....	12.25	.....	.....	.....	9.75	11.75
Machine shop turnings	15.50	14.25	14.50	13.75	14.25	14.25	14.75	15.00	.....	15.00	13.00	13.35	15.50	15.00	Alloy, W. Va. 17.60		.....	10.00	12.00
Shoveling turnings	16.50	15.25	15.50	14.75	15.25	15.25	15.75	16.00	.....	16.00	14.00	14.35	16.50	.....	.....	.....	.....	11.00	13.00
No. 1 busheling	19.50	18.25	17.75	17.75	18.25	18.25	18.75	19.00	.....	19.00	17.00	17.35	17.50	16.50	.....	.....	.....	14.00	16.00
No. 2 busheling	15.50	14.25	13.75	13.75	14.25	14.25	14.75	15.00	.....	15.00	13.00	13.35	13.50	12.50	.....	.....	.....	10.00	12.00
Cast iron borings	15.75	14.50	14.00	14.00	14.50	14.50	15.00	15.25	.....	[6]15.00	13.25	13.60	13.75	12.75	.....	.....	.....	10.25	12.25
Uncut structural and plate scrap	19.00	17.75	17.25	17.25	17.75	17.75	18.25	18.50	.....	18.50	18.50	16.85	17.00	16.00	.....	.....	.....	13.50	15.50
No. 1 cupola	21.00	20.00	20.00	22.50	23.00	22.00	20.00	22.00	.....	21.00	20.00	20.35	18.00	20.00	20.50	21.00	22.00	18.00	.....
Heavy breakable cast	19.50	18.50	18.50	21.00	21.50	21.00	18.50	20.50	.....	19.50	18.50	18.85	16.50	18.50	.....	.....	20.50 -	17.00	.....
Stove plate	[5]19.00	17.00	16.00	18.00	18.50	18.00	19.00	18.00	15.60	17.50	17.00	14.10	.....	17.00	17.50	18.00	14.00	14.00	11.25
Low phos. billet and bloom crops	25.00	23.75	23.75	23.25	23.75	23.75	24.25	24.50	.....	23.50	22.50	22.85	23.00	22.00	.....	.....	.....	.....	.....
Low phos. bar crops and smaller	23.00	21.75	21.75	21.25	21.75	21.75	22.25	22.50	.....	21.50	20.50	20.85	21.00	20.00	.....	.....	.....	.....	.....
Low phos. punchings and plate scrap [1]	23.00	21.75	21.75	21.25	21.75	21.75	22.25	22.50	.....	21.50	20.50	20.85	21.00	20.00	.....	.....	.....	.....	.....
Machinery cast, cupola size [2]	22.00	21.00	21.00	23.50	24.00	23.50	21.00	23.00	.....	22.00	21.00	21.35	19.00	21.00	21.50	22.00	23.00	19.00	.....
No. 1 mach. cast, drop-broken, 150 lbs. and under	22.50	21.50	21.50	24.00	24.50	24.00	21.50	23.50	.....	22.50	21.50	21.85	19.50	21.50	22.00	22.50	23.50	19.50	.....
Clean auto cast	22.50	21.50	21.50	24.00	24.50	24.00	21.50	23.50	.....	22.50	21.50	21.85	19.50	21.50	22.00	22.50	23.50	19.50	.....
Punchings and plate scrap [3]	22.00	20.75	20.75	20.25	20.75	20.75	21.25	21.50	.....	20.50	19.50	19.85	20.00	19.00	.....	.....	.....	.....	.....
Punchings and plate scrap [4]	21.00	19.75	19.75	19.25	19.75	19.75	20.25	20.50	.....	19.50	18.50	18.85	19.00	18.00	.....	.....	.....	.....	.....
Heavy axle and forge turnings	19.50	18.25	18.25	17.75	18.25	18.25	18.75	19.00	.....	18.00	17.00	17.35	17.50	16.50	.....	.....	.....	14.00	.....
Medium heavy electric furnace turnings	18.00	16.75	16.75	16.25	16.75	16.75	17.25	17.50	.....	16.50	15.50	15.85	16.00	15.00	.....	.....	.....	12.50	.....

[1] This grade is ¾-in. and heavier, cut 12 in. and under.
[2] May include clean agricultural cast.
[3] Under ¾ to ¼-in., cut 12 in. and under.
[4] Under ¼-in. to No. 12 gage, cut 12 in. and under.
[5] Youngstown, Warren, Sharon and Canton are not basing points on this grade.
[6] Portsmouth, Ohio, price for this grade is $15.25. Ashland, Ky., is **not** a basing point for this item.

SCHEDULE B

Railroad Scrap

Delivered Consumers' Plants Located on Line of Railroad Originating Scrap—Per Gross Ton

Basing Points → / GRADES ↓	Pittsburgh Sharon, Pa. Wheeling, W. Va. Steubenville, O. Youngstown Canton, O.	Chicago	Kokomo, Ind.	Philadelphia	Wilmington, Del.	Sparrows Point	Cleveland	Buffalo	Portsmouth, O. Middletown, O. Ashland, Ky.	St. Louis	Kansas City	Detroit	Duluth	Birmingham, Ala.	Los Angeles San Francisco Seattle	Minnequa, Colo.
No. 1 heavy melting	$21.00	$19.75	$19.25	$19.75	$19.75	$19.75	$20.50	$20.25	$20.50	$18.50	$17.00	$18.85	$19.00	$18.00	$15.50	$17.50
Scrap rails	22.00	20.75	20.25	20.75	20.75	20.75	21.50	21.25	21.50	19.50	18.00	19.85	20.00	19.00	16.50	18.50
Rerolling rails*	23.50	22.25	21.75	22.25	22.25	22.25	23.00	22.75	23.00	21.00	19.50	21.35	21.50	20.50	18.00	20.00
Scrap rails 3 ft. and under	24.00	22.75	22.25	22.75	22.75	22.75	23.50	23.25	23.50	21.50	20.00	21.85	22.00	21.00	18.50	20.50
Scrap rails 2 ft. and under	24.25	23.00	22.50	23.00	23.00	23.00	23.75	23.50	23.75	21.75	20.25	22.10	22.25	21.25	18.75	20.75
Scrap rails 18 in. and under	24.50	23.25	22.75	23.25	23.25	23.25	24.00	23.75	24.00	22.00	20.50	22.35	22.50	21.50	19.00	21.00

* Relaying quality $5 higher.

Where the railroad originator of the scrap operates in two or more of the basing points named in Schedule B, the highest of the maximum prices established for such basing points shall be the maximum price of the scrap delivered to a consumer's plant at any point on the railroad's line, *except* that switching charges of 84c. per ton shall be subtracted from the maximum prices of scrap originating from railroads operating in Chicago, and sold for consumption outside Chicago.

Explanatory Notes

(A basing point includes its switching district.)

Maximum price at which any grade of scrap may be delivered to consumer's plant, wherever located, is the shipping point price, plus actual transportation from the shipping point to consumer. Where shipment is by water, actual handling charges at the dock of not more than 75c. a gross ton may be included as part of transportation charges. In no case may this maximum price exceed by more than $1 prices in Schedule A for the basing point nearest the consumer.

COMPUTING SHIPPING POINT PRICE: A shipping point is the point from which scrap is to be shipped to consumer and is calculated by subtracting the lowest established charge for transporting scrap from the shipping point to the nearest basing point. The following are exceptions: The shipping point price at any shipping point in New England, of those grades for which no prices are listed at the basing points established for New England, shall be the Johnstown basing point price, minus all-rail transportation costs from the New England shipping point to Johnstown. However, the shipping point price at any shipping point in New England of those grades of scrap for which prices are listed at the basing points in New England shall be computed from those New England basing point prices.

REMOTE SCRAP: Material located beyond the zone from which the railroad freight rate to Pittsburgh is $11.20 is called remote scrap. Consumers desiring to purchase such scrap, but unable to do so without exceeding the ceiling prices, may make application to OPACS for permission to absorb the excess freight charges.

UNPREPARED SCRAP: Regardless of source, maximum price of unprepared scrap is $2.50 less than maximum for corresponding grade of prepared scrap.

BILLET AND BLOOM CROPS: Where such material originates in the Pittsburgh basing point, it may be sold delivered to a consumer within or without the Pittsburgh point at the price given in Schedule A, plus not more than $2.50 in transportation charges. Lowest established transportation charges will govern.

Construction Steel

. . .STRUCTURAL STEEL, REINFORCING BARS, PLATES, PILING, ETC.

Fabricated Steel

Lettings advance to 27,500 tons from 16,950 tons last week; new projects lower at 18,950 tons; plate awards total 3025 tons.

AWARDS

NORTH ATLANTIC STATES

9000 Tons, Brooklyn Navy Yard, dry docks Nos. 5 and 6, to Bethlehem Steel Co., Bethlehem, Pa.

1000 Tons, Tonawanda Township, N. Y., building for Linde Air Products Co., to American Bridge Co., Pittsburgh, through John W. Cowper Construction Co., Buffalo.

850 Tons, New York, Lincoln Tunnel, MHT-55, Plaza, for Port of New York Authority, to American Bridge Co., Pittsburgh.

300 Tons, Brooklyn, Dime Savings Bank, to Weatherly Steel Co., Weatherly, Pa.

155 Tons, Latrobe, Pa., extension to open-hearth shop, American Locomotive Co., to Phoenix Bridge Co., Phoenixville, Pa.

160 Tons, New York, Second Avenue retail market, to Dreier Structural Steel Co., New York.

100 Tons, Granby, Conn., bridge No. 46.44, New York, New Haven & Hartford Railroad, to American Bridge Co., Pittsburgh.

100 Tons, Green Haven, N. Y., industrial and shop building No. 13, to Bethlehem Steel Co., Bethlehem, Pa.

THE SOUTH

1005 Tons, Augusta, Ga., 10 warehouses for Augusta arsenal, to Ingals Iron Works Co., Birmingham.

927 Tons, Camp Stanley, Tex., six warehouses, to Mosher Steel Co., Dallas, Tex.

550 Tons, Norton, W. Va., State highway bridge, to American Bridge Co., Pittsburgh.

519 Tons, Tennessee, German Creek bridge, to Nashville Bridge Co., Nashville, Tenn.

290 Tons, Augusta, Ga., shops for Augusta arsenal, to Ingalls Iron Works Co., Birmingham.

150 Tons, Elkins, W. Va., State bridge, to America Bridge Co., Pittsburgh.

CENTRAL STATES

3650 Tons, Rock Island, Ill., arsenal warehouse, to Worden-Allen Co., Milwaukee.

2714 Tons, Dayton, Ohio, three hangars at Wright Field, to Bethlehem Steel Co., Bethlehem, Pa.

1000 Tons, Milwaukee, Falk Corp. expansion to Worden-Allen Co., Milwaukee.

596 Tons, Linn County, Iowa, Cedar River bridge, to Clinton Bridge Works, Clinton, Iowa.

400 Tons, Furnas County, Neb., bridge, to St. Joseph Structural Steel Co., St. Joseph, Mo.

100 Tons, Canton, Ohio, addition to electric furnace building, Republic Steel Corp., to Fort Pitt Bridge Works Co., Massillon.

359 Tons, Lake County, Ohio, State bridge, to American Bridge Co., Pittsburgh.

350 Tons, Duluth, Minn., State bridge No. 5777, to American Bridge Co., Pittsburgh.

259 Tons, Columbus, Ohio, research building for Battelle Memorial Institute, to Case, Crane & Kilbourne Jacobs Co., Columbus.

250 Tons, Camp Dodge, Iowa, government warehouses, to Des Moines Steel Co., Des Moines, Iowa.

240 Tons, South Chicago, Ill., mill building for Republic Steel Corp., to Joseph T. Ryerson & Son, Inc., Chicago.

210 Tons, Wayne County, Ohio, State bridge, to American Bridge Co., Pittsburgh.

120 Tons, Cleveland, addition to Pepsi-Cola building, to Fort Pitt Bridge Works Co., Pittsburgh.

117 Tons, Kieferville, Ohio, State bridge, project No. 59, to Fort Pitt Bridge Works Co., Pittsburgh.

WESTERN STATES

1700 Tons, Oakland, Cal., Navy storage buildings, to Columbia Steel Co., San Francisco, through Clinton Construction Co., San Francisco, contractor.

PENDING STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

1500 Tons, Brooklyn Navy Yard, foundry; American Bridge Co., Pittsburgh, low bidder; Thompson Starrett Co., Inc., New York, contractor.

1000 Tons, Fort Belvior, near Washington, engine equipment building; bids June 26.

900 Tons, Camden, N. J., outfitting building No. 40512 for New York Shipbuilding Corp.

850 Tons, Philadelphia, storehouses No. 201 and 202 for War Department.

560 Tons, Middletown, Pa., engine repair building, Gaw Construction Co., low bidder on general contract.

425 Tons, Dansville, N. Y., highway bridge; Hornell Construction Co., low bidder on general contract.

325 Tons, Laurel Hill, N. Y., Phelps-Dodge Corp. wire bar building.

275 Tons, Farmingdale, N. Y., Republic Aviation Corp. administration building.

260 Tons, Boston, Bird Street crossing over New York, New Haven & Hartford Railroad.

240 Tons, Beckett, Mass., Main Street State bridge.

170 Tons, Trenton, N. J., factory and office building for Thermoid Rubber Co.

165 Tons, Lewiston, N. Y., reconstruction bridge G-3 for New York Central Railroad Co.

160 Tons, Brooklyn, bulb angle curbing for Treasury Department.

125 Tons, Shelton, Conn., bridge No. 11.18 for New York, New Haven & Hartford Railroad.

115 Tons, Bayway, N. J., building for Phelps-Dodge Corp

THE SOUTH

1500 Tons, Oklahoma highway bridges, bids taken.

110 Tons, Fort Knox, Ky. and Fort Benning, Ga., pontoon treadways, etc., for U. S. Engineer's office.

CENTRAL STATES

3000 Tons, Chicago, city pumping station, filter building and administration building.

2200 Tons, Proving Ground, Ill., government warehouses, ordnance depot; previously reported as 340 tons.

1500 Tons, Columbus, Ohio, warehouses, general depot, for War Department.

1100 Tons, Ferguson, Mo., manufacturing building for Emerson Electric Co.

755 Tons, Cleveland, Warner & Swasey Co. expansion; bids in.

650 Tons, Burlington, Iowa, State bridge FAGM-414.

550 Tons, Belleview, Iowa, State bridge FAGH-419.

500 Tons, Evansville, Ind., power plant extension for Southern Indiana Gas & Electric Co.

255 Tons, East Dubuque, Ill., bridge for Illinois Central System.

185 Tons, Sault Ste. Marie, Mich., government warehouse addition.

150 Tons, Akron, Ohio, preparation building for Defense Plant Corp.

WESTERN STATES

400 Tons, Coram, Cal., roof framing, Shasta power plant, specification No. 15020-D, for Bureau of Reclamation.

FABRICATED PLATES

AWARDS

2400 Tons, various southern states, 19 tanks for Shell Oil Corp., to Chicago Bridge & Iron Co., Chicago.

250 Tons, Honolulu, T. H., gas equipment, to Western Pipe & Steel Co., San Francisco.

225 Tons, Oleum, Cal., pressure vessel, to Western Pipe & Steel Co., San Francisco.

150 Tons, Permanente, Cal., magnesium plant equipment, to Western Pipe & Steel Co., San Francisco.

PENDING PROJECTS

2250 Tons, Cresta and Pulga, Cal., penstocks for Pacific Gas & Electric Co.

350 Tons, Oleum, Cal., storage tanks.

Weekly Bookings of Construction Steel

Week Ended ⟶	June 24, 1941	June 17, 1941	May 27, 1941	June 25, 1940	Year to Date 1941	Year to Date 1940
Fabricated structural steel awards	27,500	16,950	27,450	14,900	752,910	369,580
Fabricated plate awards	3,025	1,895	590	105	75,605	65,580
Steel sheet piling awards	0	0	0	485	16,955	19,025
Reinforcing bar awards	13,255	6,680	13,110	6,350	13,735	210,400
Total Letting of Construction Steel	43,780	25,525	41,150	21,840	1,162,230	664,585

Reinforcing Steel

Awards of 13,255 tons; 11,625 tons in new projects.

AWARDS

ATLANTIC STATES

1500 Tons, Bayonne, N. J., dry dock, to Bethlehem Steel Co., Bethlehem, Pa.; George H. Flinn Corp., New York, contractor.

1000 Tons, Portsmouth, N. H., Navy Yard, to Jones & Laughlin Steel Corp., Pittsburgh; Drydock Associates, New York, contractors.

1000 Tons, Baltimore, 13 ways and shipbuilding facilities, to Bethlehem Steel Co., Bethlehem, Pa.; Booth & Flinn, Pittsburgh, contractors.

770 Tons, Johnstown, Pa., flood protection, section No. 5, to Bethlehem Steel Co., Bethlehem, Pa.; S. J. Groves & Sons Co., contractor.

750 Tons, North Bergen, N. J., factory building, to Truscon Steel Co., Youngstown, through Grand City Container Corp.

270 Tons, Harrisburg, Pa., Dauphin County court house, to Bethlehem Steel Co., Bethlehem, Pa.; William A. Berbusse Co., New York, contractor.

149 Tons, New Cumberland, Pa., War Department building, to Truscon Steel Co., Youngstown, through Alexander & Sons.

125 Tons, Landover, Md., grade elimination over Pennsylvania Railroad, to Bethlehem Steel Co., Bethlehem, Pa.; Potts & Callahan, contractors.

100 Tons, Lancaster, Pa., Hamilton Watch Co. office building, to Bethlehem Steel Co., Bethlehem, Pa.; D. S. Warfel, contractor.

SOUTH AND CENTRAL

1000 Tons, Alton, Ill., acid plant, Monsanto Chemical Co., to Missouri Rolling Mill Corp., St. Louis; Esslinger-Misch, contractors.

1000 Tons, Houston, Tex., Treasury Department, job 50514, to Southern States Steel Corp., Dallas, Tex.

900 Tons, Everett, Mass., Edison Electric Illuminating Co. of Boston power plant, to Joseph T. Ryerson & Son, Inc., Cambridge, Mass., through Thomas O'Connor Co., Boston, contractor.

800 Tons, Tulsa, Okla., bomber plant, to Sheffield Steel Corp., Kansas City, Mo.

500 Tons, Cairo, Ill., seawall, to Laclede Steel Co., St. Louis, through Great Lakes Engineering Co., Chicago, general contractor.

500 Tons, South Bend, Ind., Studebaker Corp., plane engine test building, to Inland Steel Co., Chicago.

486 Tons, Hastings, Minn., U. S. Engineer, lock No. 2, to Bethlehem Steel Co., Bethlehem, Pa.; Winston Brothers, contractors.

400 Tons, Des Moines, Iowa, Des Moines Elevator Co., to Sheffield Steel Corp., Kansas City; Jones-Hettelsater, contractors.

360 Tons, Chicago, substructure, Canal Street bridge, to Bethlehem Steel Co., Bethlehem, Pa.; Midwest Construction Co., contractor.

357 Tons, Hines, Ill., warehouse, Veterans' Hospital, to Joseph T. Ryerson & Son, Inc., Chicago.

300 Tons, South Bend, Ind., Studebaker Corp. plane engine test building, to Carnegie-Illinois Steel Corp., Chicago.

280 Tons, Norfolk, Va., Craney Island fuel pier, naval operating base, to Bethlehem Steel Co., Bethlehem, Pa.; McLean contracting Co.

150 Tons, Des Moines, Iowa, Marquette Cement plant, to Truscon Steel Co., Youngstown, through A. H. Neumann & Brother.

115 Tons, Norfolk, Va., Navy warehouse, to Truscon Steel Co., Youngstown, through Doyle & Russell.

112 Tons, Tulsa, Okla., R-2649 State Procurement Office, to Sheffield Steel Corp., Kansas City.

100 Tons, Rock Island, Ill., paving, Rock Island arsenal, to Bethlehem Steel Co., Bethlehem, Pa.; Central Engineering Co., contractor.

WESTERN STATES

126 Tons, Libby, Mont., Kootenai River Bridge, to Bethlehem Steel Co., through McNutt Bros., Eugene, Ore., contractors.

PENDING REINFORCING BAR PROJECTS

ATLANTIC STATES

1800 Tons, Charlestown, Mass., housing project.

200 Tons, Tonawanda Township, N. Y., building for Linde Air Products Co.; John W. Cowper Construction Co., Buffalo, contractor.

SOUTH AND CENTRAL

2500 Tons, Kingsbury, Ind., addition to ammunition plant.

2500 Tons, Burlington, Iowa, addition to ammunition plant.

1400 Tons, Jamestown, Ky., Wolfe Creek dam.

400 Tons, South Bend, Ind., Studebaker Corp. plane engine test building.

306 Tons, East Chicago, Ill., Standard Oil Co. connecting tunnel.

290 Tons, Indianapolis, Stout Field.

240 Tons, Portsmouth, Ohio, U. S. Engineer, flood wall, unit No. 3.

200 Tons, Alexandria, Va., Washington Navy Yard torpedo shop.

176 Tons, Chicago, WPA 57253, Lincoln Park.

150 Tons, Indianapolis, Naval ordnance plant.

120 Tons, Des Moines, Iowa, overpass, Burlington Railroad.

100 Tons, Chicago, Milwaukee Avenue paving.

WESTERN STATES

1072 Tons, North Sacramento, Cal., State highway viaduct; Earl W. Heple, San Jose, Cal., low bidder on general contract.

173 Tons, Kamiah, Idaho, Clearwater River Bridge; bids July 2.

Cast Iron Pipe

Lynn, Mass., has awarded 100 tons of 6-in. cement lined pipe to Warren Pipe Co. of Massachusetts, Boston.

Waltham, Mass., has awarded tonnage of 6 to 10-in. pipe to Warren Pipe Co. of Massachusetts, Boston, at 90c. per lin. ft. City has also awarded valve contract to Cambridge Machine & Valve Co., Cambridge, Mass., and a hydrant contract to Public Works Supply Co., Lynn, Mass.

Government is taking bids until June 27 on 8600 ft. of 6 and 8-in. pipe for a Winthrop-Fort Dawes water line; 6800 ft. of 10-in. submarine and land line from Windmill Point, Pemberton, Mass., to Fort Warren, and 2100 ft. of 8-in. submarine pipe from Fort Warren to Fort Standish, about 391 tons in all, all within Boston area.

Board of Public Works, City Hall, Waterbury, Conn., asks bids until July 8 for new high-pressure water mains, consisting of 20 to 24-in. pipe line from proposed reservoir No. 3, Town of Morris, to pumping station on Hecla Street, Waterbury, about nine miles; 20 and 12-in. pipe line from connection at Irvington Avenue and Bunker Hill Road to Highland and Washington Avenues, west side of Naugatuck River, about two and one-half miles; and 20-in. line from pumping station noted, Hecla Street, to Walnut and Farm Streets, east side of river. Alternate bids will be received for cement-lined cast iron pipe and reinforced-concrete cylinder pipe for all sizes of 20-in. and larger. Malcolm Pirnie, 25 West Forty-third Street, New York, is consulting engineer. Charles A. Root is city engineer.

Bailey, N. C., plans pipe lines for water system and other waterworks installation. Fund of $120,538 has been secured through Federal aid for this and sewage system.

Marshall, Ind., plans pipe lines for water system and other waterworks installation. Special election has been called June 27 to approve project.

Hubbard, Ohio, plans pipe lines for water system. Fund of about $26,000 has been arranged through Federal aid for this and new sewage lines.

Goodman, Mo., plans about two miles of 4-in. pipe for extensions in water system.

Palacios, Tex., plans pipe line extensions and replacements in water system. Bond issue of $30,000 has been authorized for this and extensions in sewage system.

Emmett, Idaho, plans about 13,100 ft., various sizes, for extensions in water system. G. W. Knowles, City Hall, is city engineer.

Georgetown, Ind., plans pipe lines for water system and other waterworks installation. E. H. Brown, Hanover, Ind., consulting engineer, will make surveys and estimates of cost.

Water District No. 62, Earlington Heights, near Seattle, care of Gardner, Gardner & Hitchings, Arctic Building, Seattle, consulting engineers, plans pipe lines for water system. Cost close to $30,000.

Pipe Lines

Pure Oil Co., Tulsa, Okla., plans new 6-in. welded steel pipe line from terminus of present main line from Cumberland oil field in Bryan and Marshall Counties, Okla., to Fitts oil field, Pontotoc County, about 36 miles, for crude oil transmission. Cost over $200,000 with booster pumping stations and other operating facilities. Main offices are at 35 East Wacker Drive, Chicago.

Panhandle Eastern Pipe Line Co., 101 West Eleventh Street, Kansas City, Mo., plans new welded steel pipe line from present terminus of main line from Texas Panhandle gas field, near Detroit, to Battle Creek, Mich., for natural gas transmission. Company has contracted with Battle Creek Gas Co. to furnish supply for local distribution, and change-over from artificial to natural gas will be made by latter company as soon as service is available. Battle Creek company will build control and meter stations, and make extensions and improvements in pipe lines and other facilities to handle natural gas distribution.

Bureau of Supplies and Accounts, Navy Department, Washington, closes bids July 1 for about 20,000 ft. of galvanized steel conduit pipe (Schedule 7345); steel pipe, also cast iron and wrought iron pipe, and steel tubing (Schedule 7383); brass and copper pipe and tubing (Schedule 7381), all for Oakland, Cal.

Peoples Natural Gas Co., 545 William Penn Way, Pittsburgh, plans new 6-in. welded steel pipe line across Youghiogheny River, near Layton, Perry Township, where extensions in pipe lines for natural gas transmission will be made. New line across river will be encased in 10-in. welded steel pipe with concrete lining.

Magnolia Petroleum Co., Magnolia Building, Dallas, Tex., subsidiary of Socony-Vacuum Oil Co., 26 Broadway, New York, has approved plans for new welded steel pipe line from gas field in West Ranch, Jackson County, Tex., to Beaumont, Tex., about 190 miles, for natural gas transmission for fuel for company oil refinery and other plants at latter place. About 160 miles of new line, leading from gas field, will be 14-in., while 30 miles, at Beaumont end, will be 16-in. Line will have rated capacity of 50,000,000 cu. ft. per day; no booster stations will be required. Magnolia Pipe Line Co., first noted address, an affiliated interest, will be in charge of construction. Magnolia company is returning to natural gas transmission operations after period of 12 years; such activities were discontinued in 1929, when company disposed of its natural gas pipe line systems to United Gas Pipe Line Co., Dallas.

Lion Oil Refining Co., Eldorado, Ark., has authorized extensions in welded steel pipe line system in gas field at Magnolia, Ark., for increased natural gas transmission.

Prices of Finished Iron and Steel...

Steel prices on these pages are f.o.b. basing points (in cents per lb.) unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extas, deductions, and in most cases freight absorbed to meet competition.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	
Long ternes[2]	3.80¢		3.80¢									4.55¢			
Wrought iron	4.75¢														
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢		
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.90¢		
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢								
Commodity C-R	2.95¢			2.95¢			2.95¢	(Worcester = 3.35¢)					3.05¢		
TIN PLATE Standard cokes (Per 100-lb. base box)	$5.00	$5.00	$5.00						$5.10						
BLACK PLATE 29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢ (10)			
TERNES, MFG. Special coated (Per base box)	$4.30		$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢	2.25¢		
Reinforcing (rail)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢	2.25¢		
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢)						
PLATES											(Coatesville and Claymont = 2.10¢)				
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	2.25¢		2.45¢	2.65¢		2.29¢	2.15¢
Wrought iron	3.80¢														
Floor plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	
Alloy	3.50¢	3.50¢			(Coatesville = 3.50¢)										
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
WIRE[9]															
Bright	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)								
Galvanized	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)								
Spring	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)								
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			
IRON BARS															
Common		2.25¢			(Terre Haute, Ind. = 2.15¢)										
Refined	3.75¢														
Wrought	4.40¢														

[1] Mill run sheets are 10c. per 100 lb. less than base; and primes only. 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to 29 gage within certain width and length limitations. [6] For merchant trade. [7] Straight lengths as quoted by distributers. [8] Also shafting. For quantities of 20,000 to 39,999 lb. [9] Carload lot to manufacturing trade. [10] Boxed.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are $2 higher f.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Shell Steel

Basic open hearth shell steel f.o.b. Pittsburgh and Chicago.

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting to length, or quantity. This type of steel is for hot rolled sections used for the forging of shells and includes rounds, round squares, and special sections.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)	*Per Lb.*
Pitsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., $3 a net ton higher. Quantity extras apply.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh; Package, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00
25-lb. coating I.C.	8.00	16.00
30-lb. coating I.C.	8.63	17.25
40-lb. coating I.C.	9.75	19.50

WIRE PRODUCTS

(To the Trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham)

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cut nails, carloads	3.85
	Base per 100 Lb.
Annealed fence wire	$3.05
	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	59
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

Note: Birmingham base same on above items, except spring wire.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine and carriage bolts:	
½ in. and smaller by 6 in. and shorter	65½
9/16 and ⅝ in. by 6 in. and shorter	63½
¾ to 1 in. by 6 in. and shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65
Nuts, cold punched or hot pressed, hex. or square:	
½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above items, excepting plow bolts, additional allowance of 10 per cent for full container quantities.

On all of the above items there is an additional 5 per cent allowance for carload shipments.

Semi-fin. hexagon nuts	U.S.S.	S.A.E.
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full container lots, 10 per cent additional discount.

Stove bolts, packages, nuts loose 71 and 10

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York lots of 200 lb. or over.

Stove bolts in packages, with nuts attached	71
Stove bolts in bulk	80

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pitsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws *Per Cent Off List*

Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Filister head cap screws, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

NON-FERROUS PRICES

Cents per lb. for early delivery

	June 18	June 19	June 20	June 21	June 23	June 24
Copper, Electrolytic[1]	12.00	12.00	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00	12.00	12.00
Tin, Straits, New York[2]	52.625	52.875	53.00	....	53.00	52.75
Zinc, East St. Louis	7.25	7.25	7.25	7.25	7.25	7.25
Lead, St. Louis[3]	5.70	5.70	5.70	5.70	5.70	5.70

[1] Mine producers' quotations only, delivered Conn. Valley. Deduct ¼c. for approximate New York delivery price. [2] Add 0.39c. for New York delivery. [3] Add 0.15c. for New York delivery.

Warehouse Products

Cents per lb., Delivered

Tin	New York	Cleveland
Straits pig	53.60	55.00
Copper		
Electro	13.00	13.50
Castings	12.50	13.00
H. R. Sheets*	20.87	20.87
Seamless tubes*	21.37	21.37
Brass		
Yellow sheets*	19.48	19.48
Yellow, rods*	15.01	15.01
Seamless tubes*	22.23	22.23
Zinc		
Slabs	Nom'al	Nom'al
Sheet, No. 9 casks	Nom'al	Nom'al
Lead		
American pig	6.85	6.35
Bar	8.70	8.85
Cut sheets	9.00	91.0
Antimony		
Asiatic	16.00	17.00
Aluminum		
Virgin, 99%	20.00	21.00
No. 1 remelt, 98-99%	18.00	18.50
Solder		
½ and ½	32.50	32.75
Babbitt		
Anti-friction grade	23.50	21.75

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their use.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper		
Hvy. crucible	11.00	11.625
Hvy. and wire	10.00	10.50
Light and bottoms	8.75	9.25
Brass		
Heavy	6.25	6.75
Light	5.25	6.00
No. 1 yel. turn	6.00	6.50
No. 1 red or compo. turnings	9.625	10.625
Hvy. Mach. compo.	9.875	10.125
Lead		
Heavy	5.00	5.50
Aluminum		
Cast	11.00	12.00
Sheet	12.00	13.50
Zinc	....	5.10

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cent plus, 17c.-18c. a lb.; No. 12 remelt No. 2, standard, 16c. a lb. NICKEL electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt: Asiatic, 16.50c. a lb., New York; American, 13c. a lb., f.o.b. smelter. QUICKSILVER, $188, per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 13.25c. a lb.

*These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33⅓; on brass sheets and rods, 40; on brass tubes, 33⅓, and copper tubes, 40.

ALLOY STEEL

Alloy Steel Blooms, Billets and Slabs

Base per gross ton, f.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem.....$54.00

Alloy Steel Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade .....2.70c.
Delivered, Detroit .....2.80c.

S.A.E. Series Numbers	Alloy Differential, per 100 Lb.
2000 (1.5 Ni)	$0.35
2100 (1.5 Ni)	0.75
2300 (3.5 Ni)	1.70
2500 (5 Ni)	2.55
3100 Ni-Cr	0.70
3200 Ni-Cr	1.35
3300 Ni-Cr	3.80
3400 Ni-Cr	3.20
4100 Cr-Mo (0.15 to 0.25 Mo.)	0.55
4100 Cr-Mo (0.25 to 0.40 Mo.)	0.75
x4340 Cr-Ni-Mo	1.70
4340 Cr-Ni-Mo	1.85
4600 Ni-Mo (0.2-0.3 Mo, 1.5-2 Ni)	1.20
5100 (0.60-0.90 Cr)	0.35
5100 (0.80-1.10 Cr)	0.45
5100 Cr spring steel	0.15
52-100 Cr. (electric furnace)	2.60
6100 Cr-V bar	1.20
C-V	0.85
6100 Cr-V spring steel	0.85

The above differentials are for hot rolled finished products. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

Alloy Cold-Finished Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.35c. Delivered Detroit, 3.45c. carlots.

Alloy Steel Plates

Base per lb., f.o.b. Pittsburgh, Chicago and Coatesville.

Open hearth grade .. ..3.50c.

7 is a most significant number in lifting

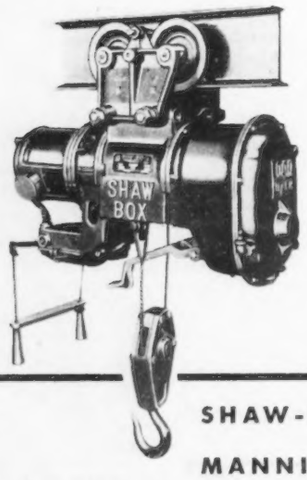
Built into Shaw-Box electric hoists are 7 vital features as well as sound basic design that comes from more than fifty continuous years of hoist and crane engineering.

Any good engineer will read these 7 guides to hoist-buying and visualize what they mean in operation and results.

There will be more and faster production, lowered costs and increased profits, happier and more efficient workmen because you have provided them with the best lifting machine to help them produce.

Here are 7 reasons why you should insist on "SHAW-BOX"

1. "One-point" Lubrication
2. Interchangeable suspension
3. "Fool-proof" Upper Stop
4. Two-gear Reduction Drive
5. Hyatt Roller Bearings
6. Enclosed Construction
7. Ball Bearing Motor



SHAW-BOX Electric Hoists are made in a range of lifting capacities from 250 lbs to 20 tons and in combinations and arrangements to suit your own special needs no matter for what industry they are required.

Let us quote on any lifting equipment you need. We may save you money. We can surely supply the correct hoist or crane. Send for catalog with complete information and illustrations.

Makers of all types and sizes of Electric and Hand Operated Cranes and Electric Hoists . . . Send all your crane and hoist inquiries to Shaw-Box!

SHAW-BOX CRANE & HOIST DIVISION
OF
MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

STAINLESS AND HEAT-RESISTANT ALLOYS

(Base prices, cents per lb., f.o.b. Pittsburgh)

Chromium-Nickel

No.	304	302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29 00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium

No.	410	430	442	446
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
H'tstrip	17.00c.	17.50c.	24.00c.	35.00c.
C'ld st.	22.00c.	22.50c.	32.00c.	52.00c.

20% Chromium-Nickel Clad Steel

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

TOOL STEEL

(F.o.b. Pittsburgh)

	Base per Lb.
High speed	67c.
High-carbon-chromium	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c. a lb. higher.

ELECTRICAL SHEETS

(F.o.b. Pittsburgh)

	Base per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

Silicon strip in coils—Sheet price plus silicon sheet extra width extra plus 25c. per 100 lb. for coils. Pacific ports add 70c. a 100 lb.

CAST IRON WATER PIPE

Per Net Ton

6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. dock, San Francisco or Los Angeles or Seattle	56.00

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $45 at Birmingham and $53.80 delivered Chicago.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall

(Net base prices per 100 ft., f.o.b. Pittsburgh, in carload lots)

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld, Hot Rolled
1 in. o.d. 13 B.W.G.	$9.01	$7.82	....
1¼ in. o.d. 13 B.W.G.	10.67	9.26	....
1½ in. o.d. 13 B.W.G.	11.70	10.23	$9.72
1¾ in. o.d. 13 B.W.G.	13.42	11.64	11.06
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2¼ in. o.d. 13 B.W.G.	16.76	14.54	13.79
2¼ in. o.d. 12 B.W.G.	18.45	16.01	15.16
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
2¾ in. o.d. 12 B.W.G.	21.42	18.59	17.54
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66
4½ in. o.d. 10 B.W.G.	43.04	37,35	35.22
5 in. o.d. 9 B.W.G.	54.01	46.87	44.25
6 in. o.d. 7 B.W.G.	82.93	71.96	68.14

Extras for less carload quantities:

40,000 lb. or ft. over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought iron pipe)

Base Price = $200 Per Net Ton

Butt Weld

Steel	Black	Galv.
⅛ in.	56	33
¼ to ⅜ in.	59	40½
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½

Wrought Iron	Black	Galv.
¼ and ⅜ in.	+9	+33
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18

Lap Weld

Steel		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
7 and 8 in.	65	52½
9 and 10 in.	64½	52
11 and 12 in.	63½	51
Wrought Iron		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
9 to 12 in.	28½	12

Butt weld, extra strong, plain ends

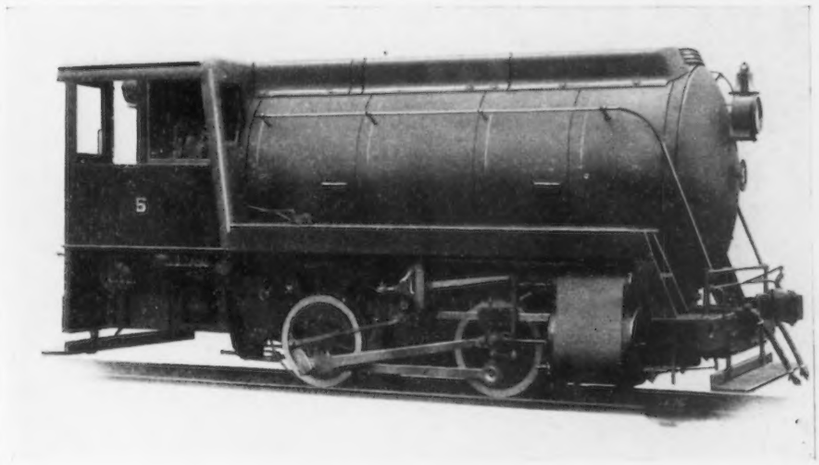
Steel	Black	Galv.
⅛ in.	54½	38½
¼ to ⅜ in.	56½	42½
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron		
¼ and ⅜ in.	+10	+46
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½

Lap weld, extra strong, plain ends

Steel		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
7 and 8 in.	65½	53
9 and 10 in.	64½	52
11 and 12 in.	63½	51
Wrought Iron		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21
7 and 8 in.	38½	21½
9 to 12 in.	32	17½

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher, on all butt weld 8 in. and smaller.



Here are Savings..

Made possible by Porter Fireless Locomotives

★ **"With two Fireless Locomotives we are saving 65% in hauling ingots at our open hearth furnaces."—Tube Mill**

★ **"We are operating the Fireless at about half the cost of our old engine."—Tie Treating Plant**

★ **"By doing our own switching with a Fireless we are saving $2,760 per year."—Machine Tool Manufacturer.**

Above are three actual statements from more-than-satisfied Porter customers. Similar savings are being reported by users of Porter Fireless Steam Locomotives throughout the country.

LOW INITIAL COST because no diesel, electric or other motors are necessary . . . **LOW OPERATING COST** because steam produced in stationary boilers is used . . . **LOW MAINTENANCE COST** because there are fewer wearing parts, no boiler or firebox . . . all these are reasons why a Porter Fireless can do your job for less. Add cleanliness, quiet operation and freedom from fire hazards and you have everything desirable in a locomotive. Write for additional information on Porter Fireless Locomotives.

ONLY PORTER BUILDS A COMPLETE LINE OF LOCOMOTIVES FOR INDUSTRY

PORTER better built locomotives

H. K. PORTER COMPANY, INC.

PITTSBURGH • PENNSYLVANIA

NEW YORK: 44 Whitehall St. CHICAGO: 310 So. Michigan Ave.

ORES

Lake Superior Ores

Delivered Lower Lake Ports

Per Grosss Ton

Old range, bessemer, 51.50%..	$4.75
Old range, non-bessemer, 51.50%	4.60
Mesaba, bessemer, 51.50%....	4.60
Mesaba, non-bessemer, 51.50%	4.45
High phosphorus, 51.50%.....	4.35

Foreign Ores*

C.i.f. Philadelphia or Baltimore, Exclusive of Duty

Per Unit

African, Indian, 44 to 48% Mn. 57c. to 61c.

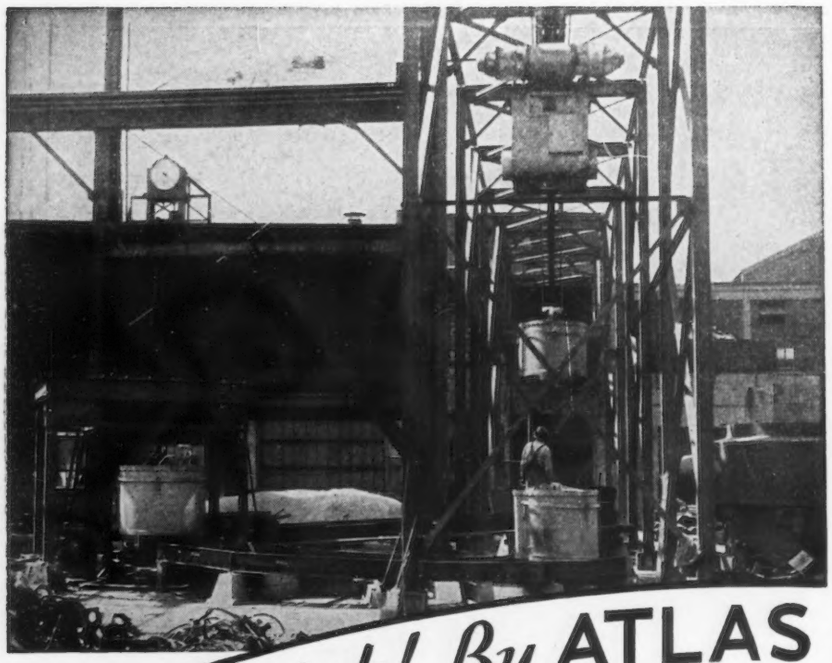
African, Indian, 49 to 51% Mn. 60c. to 65c.

Brazilian, 46 to 48% Mn...54c. to 59c.

Cuban, del'd, duty free, 51% Mn. 67½c. to 71c.

Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered....	$23 to $24
Tungsten, domestic, scheelite, delivered	$23.00
Chrome ore, lump c.i.f. Atlantic Seaboard, per gross ton; South African (low grade).....	Nom.
Rhodesian, 45%	$25.00
Rhodesian, 48% ...	$28.00 to $30.00



An Assist! By ATLAS

View at Prominent Iron Foundry

To Lower Costs!

Here Atlas - designed, Atlas - built equipment moves heavy scrap and other charging materials with consummate ease.

Monorail deposits empty bucket on roller conveyor. Bucket *rolls down* to scale platform, is charged with iron, weight read from yard crane cab. Scale platform lowers, turns, bucket *rolls down* to monorail for pick-up and charge to cupola.

A propitious circle, presaging profit at the year-end—and a definitely typical Atlas installation.

THE ATLAS CAR & MFG. CO.

Engineers **CLEVELAND, OHIO** ***Manufacturers***

serving the world with mobile handling equipment

RAILS, TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb., gross ton.....	$40.00
Angle bars, 100 lb.	2.70

F.o.b. Basing Points

Light rails (from billets), gross ton	$40.00
Light rails (from rail steel), gross ton	39.00

Base per Lb.

Cut spikes	3.00c.
Screw spikes	4.55c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast.....	2.30c.
Track bolts, steam railroads...	4.15c.
Track bolts, discount to jobbers all sizes (per 100 counts)....	65-5

Basing points, light rails—Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minneaqua, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond, Va.

FLUORSPAR *Per Net Ton*

Domestic washed gravel, 85-5 f.o.b. Kentucky and Illinois mines, all rail.....	$20.00 to $21.00
Domestic, f.o.b. Ohio River landing barges	20.00 to 21.00
No. 2 lump, 85-5 f.o.b. Kentucky and Illinois mines....	20.00 to 21.00
Foreign, 85% calcium fluoride, not over 5% Si., c.i.f. Atlantic ports, duty paid.....	Nominal
Domestic No. 1 ground bulk, 96 to 98%, calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines....	31.00
As above, in bags, f.o.b. same mines	32.60

REFRACTORIES

Fire Clay Brick *Per 1000 f.o.b. Works*

Super-duty brick at St. Louis..	$64.60
First quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	51.30
First quality, New Jersey.....	56.00
Second quality, Pennsylvania, Maryland, Kentucky, Missouri, and Illinois	46.55
Second quality, New Jersey....	51.00
No. 1 Ohio.....	39.90
Ground fire clay, per ton.....	7.60

Silica Brick

Pennsylvania	$51.30
Chicago District	58.90
Birmingham	51.30
Silica cement, net ton (Eastern)	9.00

Chrome Brick *Net per Ton*

Standard f.o.b. Baltimore, Plymouth Meeting and Chester...	$54.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	54.00

Magnesite Brick

Standard f.o.b. Baltimore and Chester	$76.00
Chemically bonded, f.o.b. Baltimore	65.00

Grain Magnesite

Imported, f.o.b. Baltimore and Chester, Pa. (in sacks).....	(—)*
Domestic, f.o.b. Baltimore and Chester in sacks.....	$44.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

*None available.

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload).....$120.00
Domestic, 78-82%, carlots, f.o.b. Tennessee furnaces 145.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%.....$36.00
Domestic, 26 to 28%..... 49.50

Electric Ferrosilicon

Per Gross Ton, Delivered Lump Size

50% (carload lots, bulk).....$74.50*
50% (ton lots, packed)..... 87.00*
75% (carload, lots, bulk)....135.00*
75% (ton lots, packed).....151.00*

Bessemer Ferrosilicon

Per Gross Ton, F.o.b. Jackson, Ohio

10.00 to 10.50%.....$34.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.
For each unit of manganese over 2% $1 per ton additional.
Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton, F.o.b. Jackson, Ohio

5.00 to 5.50%.....$28.50

For each additional 0.5% silicon up to 11%, 50c. a ton is added. Above 11% add 75c. a ton.
The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.
Manganese, each unit over 2%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots Lump Size, on Contract

4 to 6% carbon.....11.00c.
2% carbon .....17.50c.
1% carbon .....18.50c.
0.10% carbon .....20.50c.
0.06% carbon .....21.00c.

Spot prices are ¼c. per lb. of contained chromium higher.

Silico-Manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon $113.00*
2.50% carbon 118.00*
2% carbon 123.00*
1% carbon 133.00*

Other Ferroalloys

Ferrotungsten, per lb. contained W, del. carload..... $2.00
Ferrotungsten, 100 lb. and less 2.25
Ferrovanadium, contract, per lb. contained V, del'd $2.70 to $2.90†
Ferrocolumbium, per lb. contained columbium f.o.b. Niagara Falls, N. Y., ton lots ..... $2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C. f.o.b. furnace carload and contract, per net ton.....$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C. f.o.b. furnace, carload and contract per net ton.....$157.50
Ferrophosphorus, electric or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton 58.50
Ferrophosphorus, electrolytic 23-26% in carlots, f.o.b. Monsato (Siglo), Tenn., 24% per gross ton, $3 unitage, freight equalized with Nashville 75.00
Ferromolybdenum, per lb. Mo., f.o.b. furnace ..... 95c.
Calcium molybdate, per lb. Mo, f.o.b. furnace ..... 80c.
Molybdenum oxide briquettes 48-52% Mo, per lb. contained Mo, f.o.b. Langeloth, Pa. 80c.
Molybdenum oxide, in cans, per lb. of contained Mo, f.o.b. Washington, Pa. ..... 80c.

*Spot prices are $5 per ton higher.
†Spot prices are 10c. per lb. of contained element higher.

FUEL OIL

No. 3, f.o.b. Bayonne, N. J.....4.90c.
No. 6, f.o.b. Bayonne, N. J.....3.21c.
No. 5 Bur. Stds., del'd Chicago..3.25c.
No. 6 Bur. Stds., del'd Chicago..2.75c.
No. 3 distillate ,ed'd Cleveland.5.875c.
No. 4 indus., del'd Cleveland....5.50c.
No. 5 indus., del'd Cleveland....5.25c.
No. 6 indus., del'd Cleveland...4.875c.

Improved Impeller Design Adds New Efficiency to High Temperature Fans

Distortions and Unbalancing Avoided No Bolts, Rivets or Welds

While high temperatures are held to close limits in furnaces,—the wheel or impeller of the fan, used in the circulation of high temperature gases, is subjected to sharp and frequent variations as the flame is cut on and off . . . This causes distortions and unbalancing of the wheel unless — as in the MICHIANA High Temperature Fan—the design permits every part to move separately,—each part free to seek relief without affecting the others.

This ability to withstand temperature variations without distortion or unbalancing is the reason for the longer satisfactory life and lower maintenance of MICHIANA Fans. How this is accomplished is explained in Bulletin 638. MICHIANA PRODUCTS CORPORATION, Michigan City, Indiana.

MICHIANA HIGH TEMPERATURE FANS

COKE

Per Net Ton

Furnace, f.o.b. Connellsville, prompt.....$6.00 to $6.25

Foundry, f.o.b. Connellsville, prompt .....$6.75 to $7.00

F'dry, by-product, Chicago..... 10.50

F'dry, by-Product, New England 13.75

Foundry, by-product, Newark or Jersey City .....$12.45 to 12.95

F'dry, by-product, Philadelphia. 12.13

F'dry, by-product, Cleveland... 12.30

F'dry, by-product, Cincinnati... 11.75

Foundry, Birmingham 8.50

F'dry, by-product, St. Louis $10.75 to $11.00

BRITISH

Per Gross Ton, f.o.b. United Kingdom Ports

Ferromanganese, export £29 16s. 3d.

Tin plate, per base box. 32s. to 33s.

Steel bars, open hearth..£16 10s.

Beams, open hearth....£19 10s.

Channels, open hearth...£19 10s.

Angles, open hearth....£15 10s.

Black sheets, No. 24, gage £22 5s. max.* £22 5s. min.**

Galvanized sheets, No. 24 gage £25 12s. 6d max.*; £25 12s. 6d. min.**

*Empire markets only.
**Other than Empire markets.

PIG IRON (Per Gross Ton)

Prices delivered various consuming points indicated by bold italics

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phos.
Boston	***$25.50***	***$25.00***	***$26.50***	***$26.00***	.....
Brooklyn	***27.50***	.....	.....	***28.00***	.....
Jersey City	***26.53***	***26.03***	***27.53***	***27.03***	.....
Philadelphia	***25.84***	***25.34***	***26.84***	***26.34***	.....
Bethlehem, Pa.	$25.00	$24.50	$26.00	$25.50	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....
Steelton, Pa.	.....	24.50	.....	.....	29.50
Birdsboro, Pa.	25.00	24.50	26.00	25.50	29.50
Sparrows Point, Md.	25.00	24.50	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....
Sharpsville, Pa.††	24.00	23.50	24.50	24.00	.....
Buffalo	24.00	23.00	25.00	24.50	29.50
Cincinnati	***24.44***	***24.61***	.....	***25.11***	.....
Canton, Ohio	***25.39***	***24.89***	***25.89***	***25.39***	.....
Mansfield, Ohio	***25.94***	***25.44***	***26.44***	***25.94***	.....
St. Louis	***24.50***	***24.02***	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	.....
Granite City, Ill.	24.00	23.50	24.50	24.00	.....
Cleveland	24.00	23.50	24.50	24.00	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....
Toledo	24.00	23.50	24.50	24.00	.....
Youngstown††	24.00	23.50	24.50	24.00	.....
Detroit	24.00	23.50	24.50	24.00	.....
St. Paul	***26.63***	.....	***27.13***	***26.63***	.....
Duluth	24.50	.....	25.00	24.50	.....
Birmingham	20.38	19.00	25.00	.....	.....
Los Angeles, San Francisco and Seattle	***27.50***	.....	.....	.....	.....
Provo, Utah	22.00	.....	.....	.....	.....
Montreal†	27.50	27.50	.....	28.00	.....
Toronto†	25.50	25.50	.....	26.00	.....

GRAY FORGE

Valley or Pittsburgh fce.....$23.50

CHARCOAL

Lake Superior fce.....$28.00
Delivered Chicago 31.34

Base prices are subject to an additional charge for delivery within the switching limits of the respective districts.

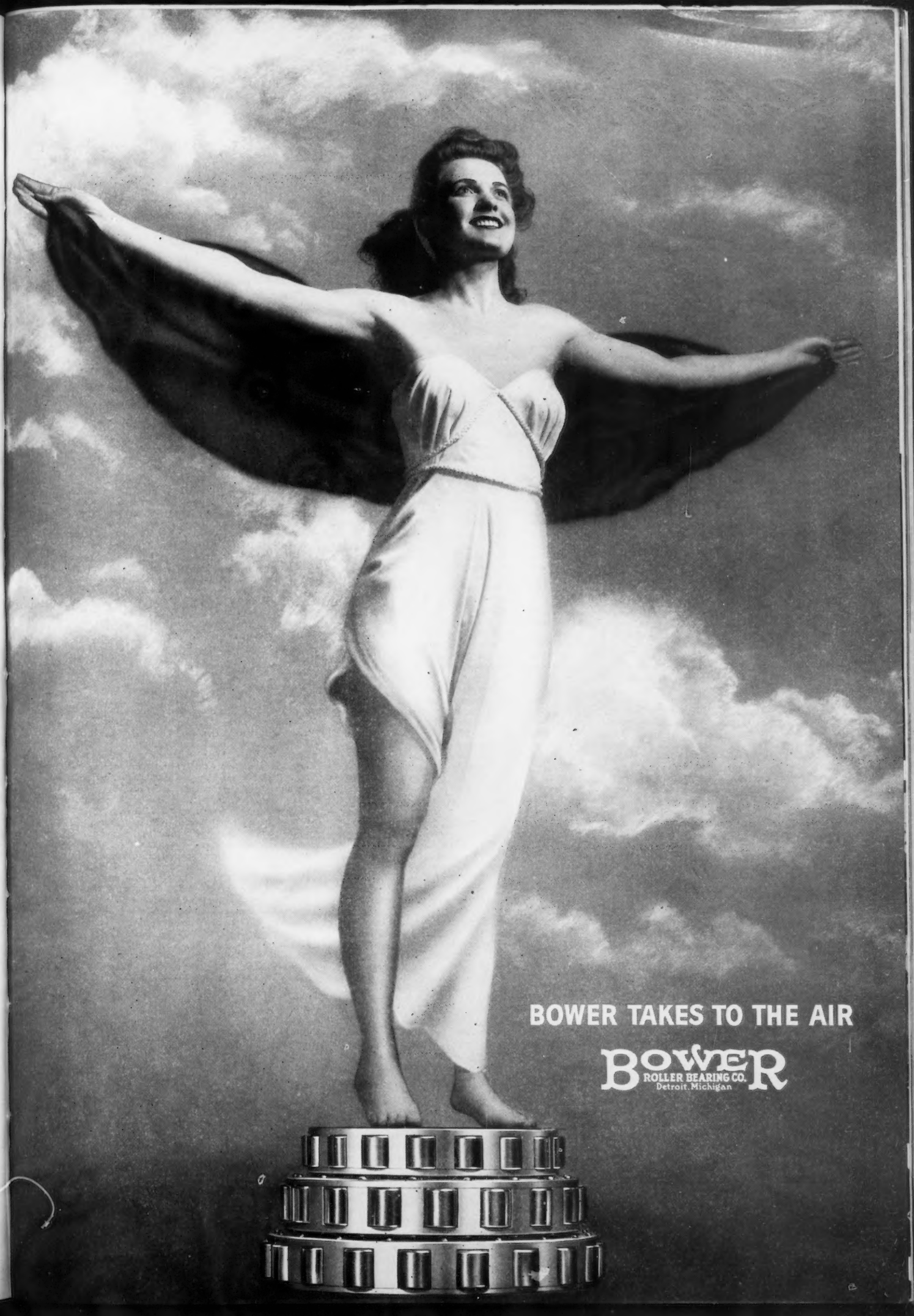
Delivered prices on Southern iron for shipment to Northern points are 38c. a ton below delivered prices from nearest Northern basing point on iron with phosphorus content of 0.70 per cent and over. †On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

††Pittsburgh Coke & Iron and Struthers furnaces are quoting $24.50 a ton for No. 2 foundry, basic and malleable, and $25.00 a ton for bessemer iron at Sharpsville and Youngstown.

WAREHOUSE PRICES

	Pittsburgh	Chicago	Cleveland	Philadelphia	New York	Detroit	Buffalo	Boston	Birmingham	St. Louis	St. Paul	Milwaukee	Los Angeles
Sheets, hot rolled	$3.35	$3.05	$3.35	$3.75	$3.58	$3.43	$3.25	$3.71	$3.45	$3.39	$3.30	$3.38	$5.10
Sheets, cold rolled	....	4.10	4.05	4.05	4.60	4.30	4.30	3.68	....	4.12	4.35	4.23	7.30
Sheets, galvanized	4.75	4.60	4.62	5.00	5.00	4.84	4.75	5.11	4.75	4.24	4.75	4.98	6.30
Strip, hot rolled	3.60	3.40	3.50	3.95	3.96	3.68*	3.82	4.06	3.70	4.99	3.65	3.73	...
Strip, cold rolled	3.20	3.30	3.20	3.31	3.51	3.20	3.52	3.46	....	3.61	3.83	3.54	....
Plates	3.40	3.55	3.40	3.75	3.76	3.60	3.62	3.85	3.55	3.69	3.80	3.68	4.95
Structural shapes	3.40	3.55	3.58	3.75	3.75	3.65	3.40	3.85	3.55	3.69	3.80	3.68	4.95
Bars, hot rolled	3.35	3.50	3.25	3.85	3.84	3.43	3.35	3.98	3.50	3.64	3.75	3.63	**4.15
Bars cold finished	3.65	3.75	3.75	4.06	4.09	3.80	3.75	4.13	4.43	4.02	4.34	3.88	6.60
Bars, ht. rld. SAE 2300	7.20	7.10	7.55	7.31	7.60	7.67	7.35	7.50	....	7.72	7.45	7.58	10.35
Bars, ht. rld. SAE 3100	5.75	5.65	5.85	5.86	5.90	5.97	5.65	6.05	....	6.02	6.00	5.88	9.35
Bars, cd. drn. SAE 2300	8.15	8.15	8.40	8.56	8.84	8.70	8.40	8.63	....	8.77	8.84	8.63	11.35
Bars, cd. drn. SAE 3100	6.75	6.75	7.75	7.16	7.19	7.05	6.75	7.23	....	7.12	7.44	6.98	10.35

BASE QUANTITIES: Hot rolled sheets, cold rolled sheets, hot rolled strip, plates, shapes and hot rolled bars, 400 to 1999 lb., galvanized sheets, 150 to 1499 lb.; cold rolled strip, extras apply on all quantities; cold finished bars, 1500 lb. and over; SAE bars, 1000 lb. and over. Exceptions: Chicago, galvanized sheets, 500 to 1499 lb.; Philadelphia, galvanized sheets, one to nine bundles, cold rolled sheets, 1000 to 1999 lb.; Detroit, galvanized sheets, 500 to 1499 lb.; Buffalo, cold rolled sheets, 500 to 1500 lb., galvanized sheets, 450 to 1499 lb., cold rolled strips, 0.0971 in. thick; Boston, cold rolled and galvanized sheets, 450 to 3749 lb.; Birmingham, hot rolled sheets, strip and bars, plates and shapes, 400 to 3999 lb., galvanized sheets, 500 to 1499 lb.; St. Louis, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 500 to 1499 lb., cold rolled strip 0.095 in. and lighter; Milwaukee, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 500 to 1499 lb.; New York, hot rolled sheets, 0 to 1999 lb., cold rolled sheets, 400 to 1499 lb.; St. Paul, galvanized and cold rolled sheets, any quantity, hot rolled bars, plates, shapes, hot rolled sheets, 400 to 14,999 lbs.; Los Angeles, cold rolled sheets, 300 to 1999 lb., galvanized sheets, 24 ga.—1 to 1499 lb. Extras for size, quality, etc., apply on above quotations. *12 gage and heavier, $3.43. **Over 4 in. wide and over 1 in. thick, $4.95.


BOWER TAKES TO THE AIR
BOWER
ROLLER BEARING CO.
Detroit, Michigan

Sales Possibilities

. . . CONSTRUCTION, PLANT EXPANSION AND EQUIPMENT BUYING

North Atlantic States

• **Allen Mfg. Co.,** 133 Sheldon Street, Hartford, Conn., hollow set screws, dowel pins, pipe plugs, etc., has let general contract to Samuel Walker, 1268 Main Street, East Hartford, for two-story addition. Cost about $45,000 with equipment. William T. Marchant, 36 Pearl Street, Hartford, is architect.

Town Board of Selectmen, 126 Church Street, Putnam, Conn., plans new steel hangar at municipal airport, with machine and repair shop for aircraft mechanic classes. Fund of $40,000 has been arranged for project.

Shell Oil Co., Inc., 50 West Fiftieth Street, New York, has approved plans for new bulk oil terminal at West Boylston, Mass., including pumping station, steel tank units, and other facilities. Cost over $175,000 with equipment.

Stanley Works, Inc., Seaview Avenue, Bridgeport, Conn., has filed plans for one-story addition. Cost close to $40,000 with equipment.

Acme Wire Co., Dixwell Avenue, New Haven, Conn., electrical wire, condensers, coils, etc., plans addition to steam power house, with installation of new boiler unit and auxiliary equipment. Cost about $45,000 with equipment. Westcott & Mapes, Inc., 139 Orange Street, is consulting engineer.

Ford Instrument Co., Rawson Street, Long Island City, gun control and calculator instruments and parts, has let general contract to Laurance C. Roberts, Inc., 1 East Forty-second Street, New York, for alterations and improvements in six-story building at Queens and Dutch Kills Street, recently purchased from Anchor Cap & Closure Corp., for new plant. Cost close to $60,000 exclusive of equipment. New plant will total about 310,000 sq. ft. of floor space. Francisco & Jacobus, 511 Fifth Avenue, New York, are architects and engineers. Company is a subsidiary of Sperry Corp., Brooklyn.

Superior Bronze Corp., 771 First Avenue, New York, bronze, brass and other metal castings, has purchased a one-story building at 139-151 Banker Street, Brooklyn, on site 123 x 148 ft., for new foundry.

American Car & Foundry Co., 30 Church Street, New York, has let general contract to Neigborgall & Leach, Inc., Fifth Avenue Arcade Building, Huntington, W. Va., for extensions and improvements in plant at Huntington, including new one-story wheel foundry, 140 x 165 ft., to replace present unit; cupola charging house, 38 x 42 ft., and 80 ft. high; new office building and other work. Cost over $150,000 with equipment.

New York Central Railroad Co., 466 Lexington Avenue, New York, F. S. Austin, purchasing agent, asks bids until June 30 for axles, nails, chilled iron wheels, pipe, insulated magnet wire, roller bearings, track bonds and other equipment (Serial Contract No. 9, 1941).

International Paper Co., 220 East Forty-second Street, New York, has arranged fund of $4,500,000 for expansion and improvements in pulp and paper mills, a considerable part of appropriation to be used for extensions in plant of Southern Kraft Corp., a subsidiary at Georgetown, S. C., to include paper-making machine and auxiliary equipment. Company has disposed of bond issue totaling $26,500,000, from which fund will be secured.

Port of New York Authority, 111 Eighth Avenue, New York, Frank C. Ferguson, chairman, asks bids until July 1 for river ventilation building for North tube of Lincoln tunnel, at New York (Contract MHT-57).

Bruening-Winans Corp., 205 St. Paul Street, Rochester, N. Y., machinery and parts, has plans by S. Firestone, 59 South Avenue, architect and engineer, for one-story addition for production of aircraft parts for government, which recently authorized fund of about $93,500 for building and equipment.

Allegany Refiners, Inc., Bolivar, N. Y., has purchased refinery of Oil Creek Refining Co., Titusville, Pa., and will remove all machinery and equipment to Bolivar refining plant, where expansion will be carried out. New one-story building will be built at last noted plant for wax processing department and filter house.

War Department, Washington, has authorized purchase of tract at Kendaia, Seneca County, N. Y., for new ordnance depot, to include one and multi-story buildings for storage, distribution and other service, mechanical shops, boiler house and other structures. Fund of about $7,000,000 is being arranged for project.

Buffalo Arms Corp., 537 East Delavan Avenue, Buffalo, subsidiary of Houdaille-Hershey Corp., Detroit, will carry out expansion in new plant in course of erection at Cheektowaga, for production of small fire arms for government. Large one-story unit will be built, with auxiliary structures for manufacture of aircraft machine guns for War Department. Fund of $10,870,000 will be provided by Defense Plant Corp., Washington.

Federal Shipbuilding & Dry Dock Corp., Lincoln Highway, Kearny, N. J., has let general contract to Carl Buhr, Inc., Grand Central Terminal, New York, for two one-story additions, for expansion in assembling department and for new machine shop, latter structure to be about 100 x 125 ft. Cost about $175,000 with equipment.

Walter Kidde & Co., Inc., 60 West Street, Bloomfield, N. J., fire extinguishers and systems, etc., will carry out expansion in new plant at Washington Avenue and line of Erie Railroad, Belleville, N. J., where work is nearing completion on two-story and basement works on 30-acre tract, for production of aircraft equipment for government. New construction will comprise one-story building about 190,000 sq. ft. of floor space, of which 150,000 sq. ft. will be used for manufacturing and remainder for office and other operating service. High-pressure gas equipment and allied specialties for airplanes and naval craft for Navy Department will be produced. Fund of $2,242,300 will be provided by Defense Plant Corp., Washington, of which about $1,252,000 will be expended for equipment and remainder for building. Company also will expand Bloomfield works for manufacture of aircraft fire control apparatus for government. Fund of $132,725 has been arranged through same source for this development. It is understood that all construction will be carried out by Walter Kidde Constructors, Inc., 140 Cedar Street, New York, affiliated interest, which is now erecting initial plant at Belleville.

Acme Rubber Mfg. Co., Inc., East State Street, Trenton, N. J., mechanical rubber goods, has let general contract to Newton A. K. Bugbee Co., 206 East Hanover Street, for one-story addition, 120 x 250 ft. Cost over $125,000 with equipment.

Scott Paper Co., Chester, Pa., has approved plans for two-story addition to one-story mill, about 51,000 sq. ft. of floor space, for expansion in finishing department and other divisions. Cost close to $200,000 with machinery.

J. G. Brill Co., Sixty-second Street and Woodland Avenue, Philadelphia, railroad cars and trucks, plans one-story addition, about 60 x 600 ft. Cost over $100,000 with equipment.

Pennsylvania Edison Co., Altoona, Pa., has approved plans for expansion in steam-electric generating station at Williamsburg, Pa., to include new 25,000-kw. turbine-generator unit and auxiliaries, high-pressure boilers and auxiliary equipment. Cost close to $3,000,000 with transmission line extensions, power substations and other operating facilities.

Board of Public Education, Administration Building, Bellefield Avenue and Forbes Street, Pittsburgh, asks bids until July 1 for machinery, tools, electric supplies and other equipment for schools. H. W. Cramblet is secretary.

Erie Resistor Corp., 644 West Twelfth Street, Erie, Pa., condensers, plastic products, etc., has let general contract to Upton-Lang Co., Twelfth and State Streets, for new one-story plant, 150 x 210 ft., near city limits. Cost close to $100,000 with equipment. E. S. Phillips, 228 Commerce Street, is architect.

Milcor Steel Co., Fayette and Oldham Streets, Baltimore, metal lath, sheet metal products, etc., plans new one-story plant at Philadelphia Road and Erdman Avenue. Cost over $65,000 with equipment. Main offices are at Milwaukee.

Bureau of Yards and Docks, Navy Department, Washington, asks bids (no closing date stated) for low-pressure fire-tube boiler unit, oil-burning equipment, piping and accessories for power house at naval radio receiving station, Cheltenham, Md. (Specification 10437).

Lever Brothers Co., 5300 Holabird Avenue, Baltimore, soap and allied products, has let general contract to Stone & Webster Engineering Corp., 49 Federal Street, Boston, for one-story addition. Cost close to $150,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 1 for conduit pipe (Schedule 7345), expanded metal (Schedule 7349), stockless anchors (Schedule 7446) for Eastern and Western Navy yards; until July 3 for 800 portable electric drills (Schedule 7368) for Sewall's Point, Va., yard.

The South

• **E. I. du Pont de Nemours & Co., Inc.,** Wilmington, Del., will carry out expansion in new synthetic ammonia plant in course of erection at Morgantown, W. Va., for production for government. Work will comprise additional one and multi-story units, with shops, storage and distributing buildings, and other structures to more than double capacity of initial plant. Fund of $18,500,000 will be furnished by government for buildings and equipment. Appropriation for initial works, now under way, was about $15,000,000.

Masonite Corp., Laurel, Miss., insulation board, wall board and other pulp products, has work in progress on expansion and improvements, to represent ultimate investment of about $700,000 with machinery. A multi-story addition will be built to die stock department, for production for aircraft industry; also addition to pressed-board-manufacturing division, including equipment. Expansion and improvements will be carried out in insulating board mill, with installation of additional equipment, to cost approximately $100,000. Company also has work under way on new steam-electric generating station, to cost close to $800,000 with equipment, in addition to sum first noted.

Park & Tilford Distillers of Kentucky, Inc., Thirty-fifth and Tyler Streets, has approved plans for new eight-story and basement storage and distributing building, about 115 x 280 ft. Cost over $200,000 with equipment. Thomas J. Nolan, Kentucky Home Life Building, is architect.

City Council, Monroe, La., asks bids until July 8 for steam-generating unit and auxiliary equipment for municipal power plant, where expansion and improvements will be made. Bond issue of $875,000 was voted recently for entire project, including electrical distribution system. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

Charleston Shipbuilding & Drydock Co.,

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SUPERIOR

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Charleston, S. C., will have plans drawn by Dotterer Engineering Co., 21 Broad Street, consulting engineer, for expansion and modernization in shipyard on Gadsden Creek, including new shipways, marine railway, mold loft and mechanical shops, and other structures. Cost over $600,000 with equipment.

War Department, Washington, has acquired about 2200 acres at Wellston, near Macon, Ga., for new air corps depot, consisting of one and multi-story buildings, air field with hangars and repair shops, general machine shops, power substation and auxiliary structures. Fund of about $14,000,000 will be allotted for project.

Lone Star Gas Co., 1915 Wood Street, Dallas, Tex., plans new gas recycling plant in gas field near Greegton, Tex., for natural gasoline production, comprising processing units, compressor station, boiler plant, pumping station, shops, steel tank storage units and other facilities. Cost over $400,000 with machinery.

Central States

• **Cleveland Pneumatic Tool Co.,** 3734 East Seventy-eighth Street, Cleveland, has asked bids on revised plans for two-story addition, about 67,000 sq. ft. of floor space, for a machine shop. Cost over $200,000 with equipment. McGeorge-Hargett, Inc., 9400 Quincy Avenue, is consulting engineer.

Chevrolet-Norwood Division, General Motors Corp., 4726 Smith Road, Norwood, Cincinnati, has let general contract to J. & E. Warm Co., 2335 Florence Avenue, Cincinnati, for two-story addition, 75 x 125 ft., to local parts and assembling plant. Cost over $125,000 with equipment.

Champion Machine & Forging Co., 3695 East Seventy-eighth Street, Cleveland, drop and upset forgings, plans addition for production of steel forgings for aircraft for government, consisting of main one-story unit and auxiliary buildings. Cost estimated at $2,699,600, of which about $2,000,000 will be used for equipment and remainder for site and buildings. Appropriation in gross amount will be furnished by government.

Spicer Mfg. Corp., 4100 Bennett Road, Toledo, Ohio, universal joints and other automotive products, will begin work soon on one-story addition, 165 x 200 ft., for expansion in production department, with three-story office, about 100 x 165 ft., adjoining. Cost close to $500,000 with equipment. A. Bentley & Sons Co., 201 Belmont Avenue, is general contractor.

Griscom-Russell Co., Massillon, Ohio, steam specialties, heat transfer equipment, will begin superstructure for two one-story additions, 70 x 140 ft., and 60 x 110 ft., for expansion in welding works and machine shop, in order noted. General contract has been let to B. & H. Construction Co., Massillon. Cost close to $100,000 with equipment.

E. I. du Pont de Nemours & Co., Inc., Grasselli chemicals plant, 2615 Independence Road, Cleveland, has approved plans for four-story addition, 60 x 60 ft., for a furnace building. Cost over $75,000 with equipment. Company has plans under way for a new power house and pumping station.

General Electric Co., Fort Wayne, Ind., has let general contract to Indiana Engineering & Construction Co., Old First Bank Building, for two-story addition. Cost over $70,000 with equipment.

International Steel & Iron Co., Edgar Street, Evansville, Ind., fabricated steel products, steel doors, etc., has let general contract to Tri-State Contracting Co., 1525 Shanklin Avenue, for one-story addition. Cost over $50,000 with equipment.

Studebaker Corp., West Chippewa Avenue, South Bend, Ind., will begin superstructure soon for one-story addition, 156 x 760 ft., for an engine-testing unit, at new plant in course of erection for Wright aircraft engines for War Department. Cost about $1,000,000 with machinery. Entire project will represent investment of about $10,000,000, which is being furnished by Government. Giffels & Vallet, Inc., Marquette Building, Detroit, is architect and engineer.

Federated Metals Division, American Smelting & Refining Co., 4041 Park Avenue, St. Louis, lead products, etc., has let general contract to J. S. Alverici Construction Co., Boatmen's Bank Building, for one-story addition. Cost over $75,000 with equipment.

Board of Directors, David Ranken Jr. School of Mechanical Trades, 4431 Finney Avenue, St. Louis, has let general contract to R. W. Morrison Construction Co., International Life Building, for two-story addition, 103 x 110 ft., for a mechanical shop. Cost over $80,000 with equipment. Frank L. Thompson, 106 West Adams Street, is architect.

National Guard Bureau, U. S. Property and Disbursing Office, State Office Building, Jefferson City, Mo., has let general contract to Vernon Higbee Construction Co., 6504 Nashville Avenue, St. Louis, for addition to hangar at St. Louis municipal airport, Robertson, for 110th Observation Squadron, at $50,800, exclusive of equipment. Shop facilities for repairs and maintenance will be provided.

Motor Wheel Corp., Lansing, Mich., steel wheels and parts, has let general contract to Reniger Construction Co., Lansing, for one-story addition. Cost over $60,000 with equipment.

Chrysler Corp., Detroit, has let general contract to F. H. Martin Construction Co., 955 East Jefferson Street, for one-story addition, 235 x 280 ft., to DeSoto Division plant, Wyoming Avenue, for expansion in press shop; also award to W. E. Wood Co., 4649 Humboldt Street, for one-story addition, 240 x 520 ft., to plant on Kercheval Avenue for extensions in machine shop and service department. Both structures will cost over $700,000 with equipment. Albert Kahn Associated Architects & Engineers, Inc., New Center Building, is architect and engineer.

A.C. Spark Plug Division, General Motors Corp., Flint, Mich., has approved plans for one-story addition. Cost about $125,000 with equipment.

Central Specialty Co., Ypsilanti, Mich., iron and other metal castings, plans expansion in foundry, including equipment. Company is arranging sale of stock totaling about $300,778, of which approximately $115,000 will be used for purpose noted.

Eddy Stoker Corp., 4717 West North Avenue, Chicago, has taken out permit for two-story addition, 60 x 84 ft., for which general contract recently was let to H. Borre & Son, Inc., 3808 West North Avenue. Cost over $50,000 with equipment. Engineering Systems, Inc., 221 North LaSalle Street, is architect and engineer.

American Varnish Co., 1140 North Branch Street, Chicago, has asked bids on general contract for three-story addition, 65 x 85 ft. Cost close to $70,000 with equipment. Engineering Systems, Inc., 221 North LaSalle Street, is architect and engineer.

City Council, Woodstock, Ill., asks bids until July 18 for new boiler unit, feedwater heaters and boiler feed pumps, with accessories, for municipal power plant.

National Pressure Cooker Co., Ball Street, Eau Claire, Wis., canning and cooking equipment, has let general contract to Hoeppner-Bartlett Co., 631 East Madison Street, for two-story and basement addition, 45 x 80 ft., with wing extension, about 20 x 21 ft., for storage and distribution. Cost over $40,000 with equipment.

Weber Machine & Mfg. Co., Kearney, Neb., machinery and parts, has let general contract to J. E. Kaufman, 2716 Ninth Avenue, for one-story machine shop, 51 x 125 ft. Cost about $45,000 with equipment. J. P. Helleberg, 418 West Twenty-fifth Street, is architect.

G. D. Searle & Co., Inc., 4741 Ravenswood Avenue, Chicago, drug and chemical products, has let general contract to George A. Fuller Co., 111 West Washington Street, for new three-story and basement plant at Skokie, near Chicago, 126 x 276 ft. Cost over $450,000 with equipment. Herbert G. Banse, 605 North Michigan Avenue, is architect; A. C. King, 35 South Dearborn Street, is engineer.

Western States

• **Lockheed Aircraft Corp.,** Burbank, Cal., has let general contract to H. W. Baum Co., 232 South Van Ness Avenue, Los Angeles, for one-story addition, 190 x 200 ft., for storage and distribution, and for three one-story open structures, each 96 x 200 ft. Cost over $100,000 with equipment.

General Metals Corp., 701 105th Avenue, Oakland, has approved plans for one-story addition. Cost close to $60,000 with equipment. Irwin M. Johnson, 449 Moss Avenue, is architect.

War Department, Washington, is acquiring tract at Lemoore, Cal., for new air corps flying school, to include one and multi-story shop and mechanical buildings, hangars, gasoline storage and fueling system, and other facilities. Fund of about $4,500,000 is being arranged for project.

Western Waxed Paper Co., Division of Crown Zellerbach Corp., 910 East Sixty-first Street, Los Angeles, will begin superstructure for one-story addition, 150 x 175 ft., for storage and distribution, for which general contract recently was let to Engineers, Ltd., 605 West Olympic Boulevard. Cost over $60,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 3 for crucibles without covers for Oakland, Cal. (Schedule 7370).

Board of Education, Glendale, Cal., has asked bids on general contract for one-story technology shop building, 50 x 200 ft., at Glendale junior college. Cost over $60,000 with equipment. George Lindsey, 5810 Monte Vista Street, Los Angeles, is architect.

Bethlehem Steel Co., Twentieth and Illinois Streets, San Francisco, has let general contract to Newman, Carlsen & Franz, 59 Oak Grove Street, for one-story addition for a welding shop. Cost over $65,000 with equipment.

Canada

• **McColl Frontenac Oil Co.,** 360 St. James Street West, Montreal, plans addition to oil refinery at East Montreal, for a thermal cracking unit. Cost close to $100,000 with machinery.

Pere Marquette Railway Co., General Motors Building, Detroit, plans new engine house with shop facilities at St. Thomas, Ont., with turntable, coaling dock and other mechanical structures. Cost over $350,000 with equipment.

Canadian Car & Foundry Co., Ltd., 621 Craig Street West, Montreal, will begin superstructure for one-story forge shop, about 80 x 500 ft., for which general contract recently was let to Foundation Co. of Canada, Ltd., 1528 Sherbrooke Street West. Cost close to $200,000 with equipment.

Link-Belt, Ltd., Leslie Street and Eastern Avenue, Toronto, has plans for erection of an addition to cost $110,000.

E. Ingraham Co., Bristol, Conn., has purchased four acres at Humber Bay, Toronto, and will start work immediately on erection of a plant, first unit to cost $18,000 without equipment. It will be operated by a subsidiary, Ingraham Canadian Clock Co., Ltd., and will make clocks, watches, etc. Norman K. Ingraham will be president and A. G. Holmes manager of Canadian company.

Seiberling Rubber Co. of Canada, Ltd., 99 Paton Road, Toronto, will build plant addition to cost $100,000. Company manufactures tires and other equipment for Canadian and British armies, and has orders on hand exceeding $1,500,000.

Ford-Smith Machine Co., Ltd., Cavell Avenue, Hamilton, Ont., has awarded general contract to W. Stuart Construction Co., 15 Hyde Park Avenue, for plant addition to cost about $75,000 with equipment. Prack & Prack, 36 James Street North, are architects.

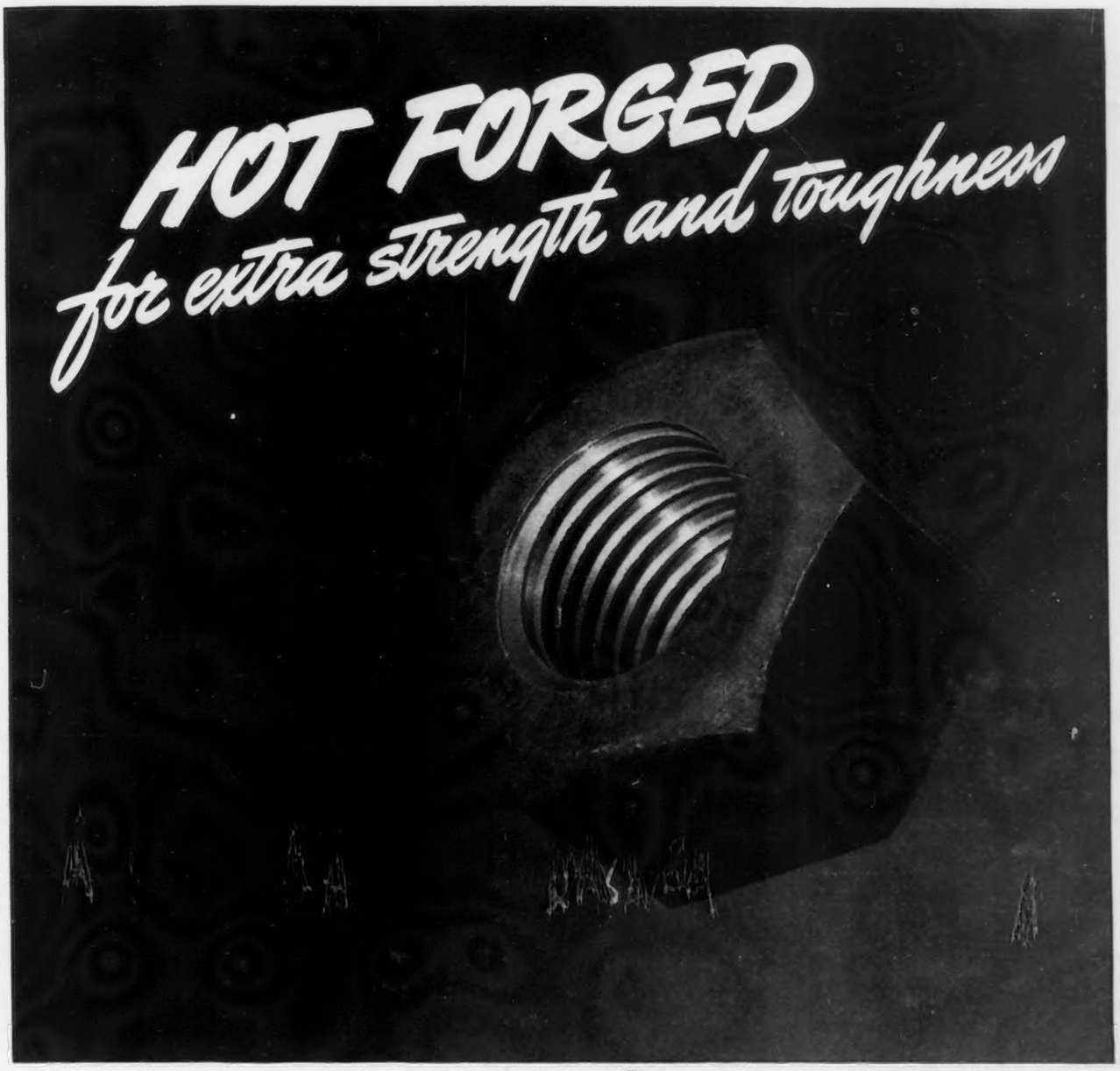
Montreal Dry Docks, Ltd., 1151 Mill Street, Montreal, has awarded general contract to Alphonse Gratton, for a machine shop to cost, with equipment, about $40,000.

Stowell-Screw Co., Ltd., 214 Sixth Avenue, Longueuil, Que., has started work on plant addition to cost about $50,000 with equipment. James W. Ross, 1010 St. Catharine Street West, Montreal, is general contractor.

Canadian Westinghouse Co., Ltd., 286 Sanford Avenue North, Hamilton, Ont., has plans by Hutton & Souter, 36 James Street East, for plant addition to cost about $100,000.

Andrews Wire Works of Canada, Ltd., Watford, Ont., Lloyd Miller, manager, has plans for an addition to cost about $50,000 with equipment.

HOT FORGED for extra strength and toughness



There's an extra margin of strength and of safety against splitting and stripping in all Bethlehem Hot-Forged Nuts. It's built into them by the exclusive Bethlehem hot-forging process—the same kind of operation that insures the uniformity and dependability of airplane cylinders.

It's a process that lifts these Bethlehem Nuts into a class by themselves, makes them completely different from ordinary "common" nuts. This outstanding difference lies in the way the hole is formed. In regular "common" nuts the hole is formed by a forceful punching action which actually tears the grain of the metal apart. This tends to cause undesirable strains and tiny cracks in the metal.

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Your distributor can supply your regular requirements for Bethlehem Hot-Forged Nuts from stock. On larger quantities or for special needs, his rush order to Bethlehem's Lebanon Plant will start a shipment on its way to you without delay.

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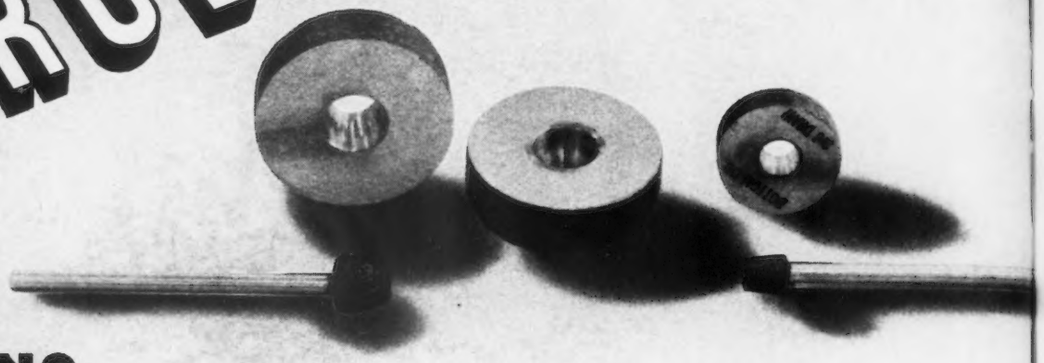

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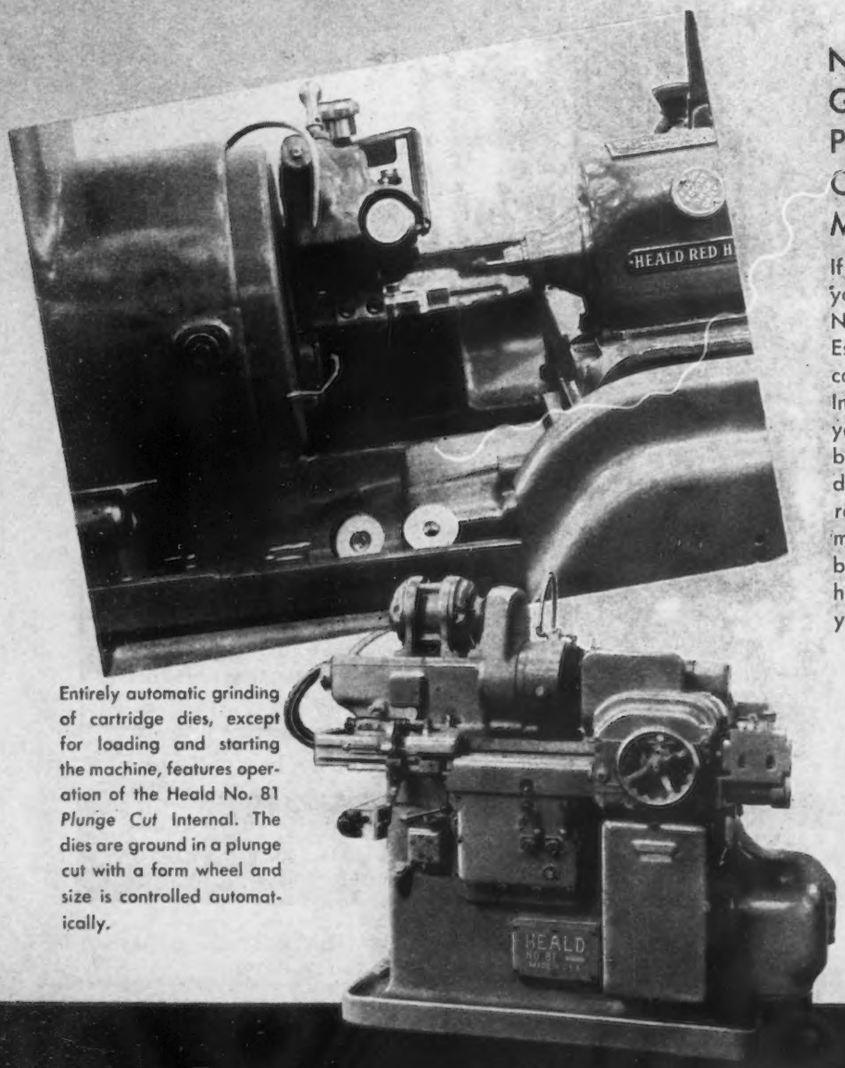

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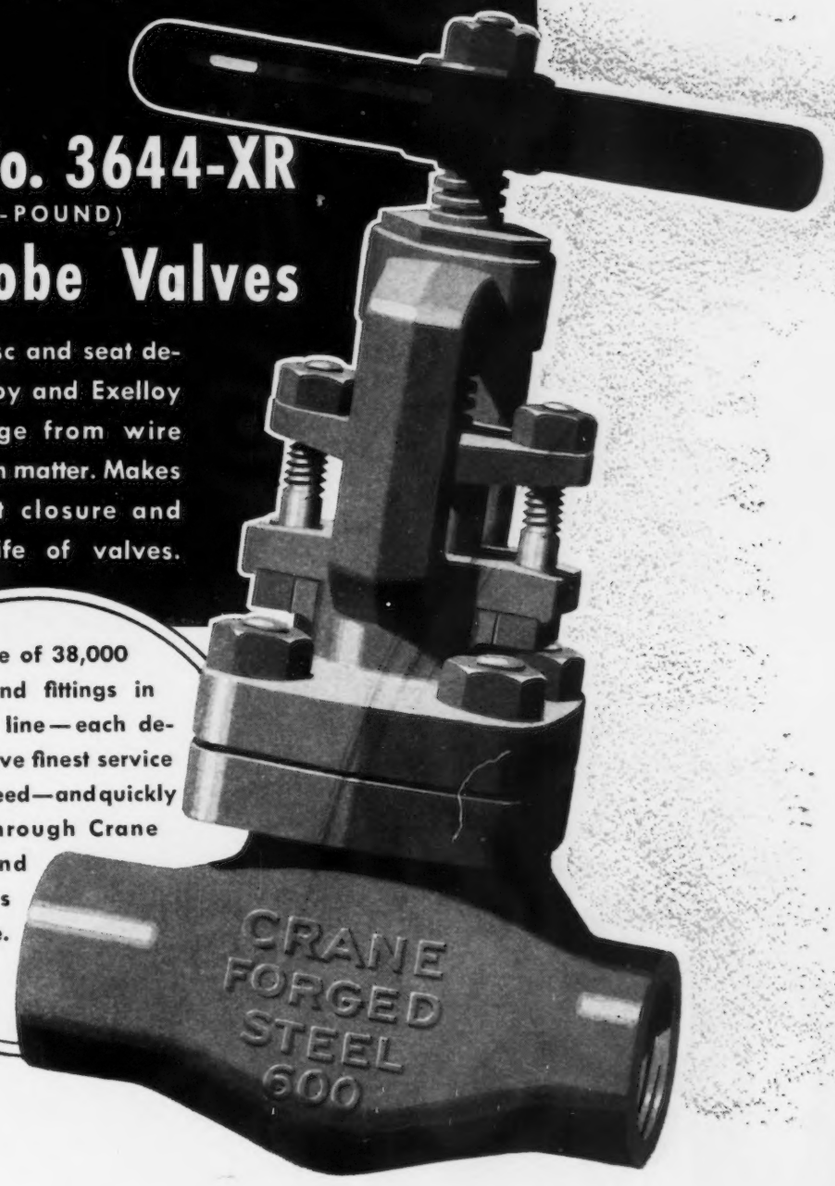

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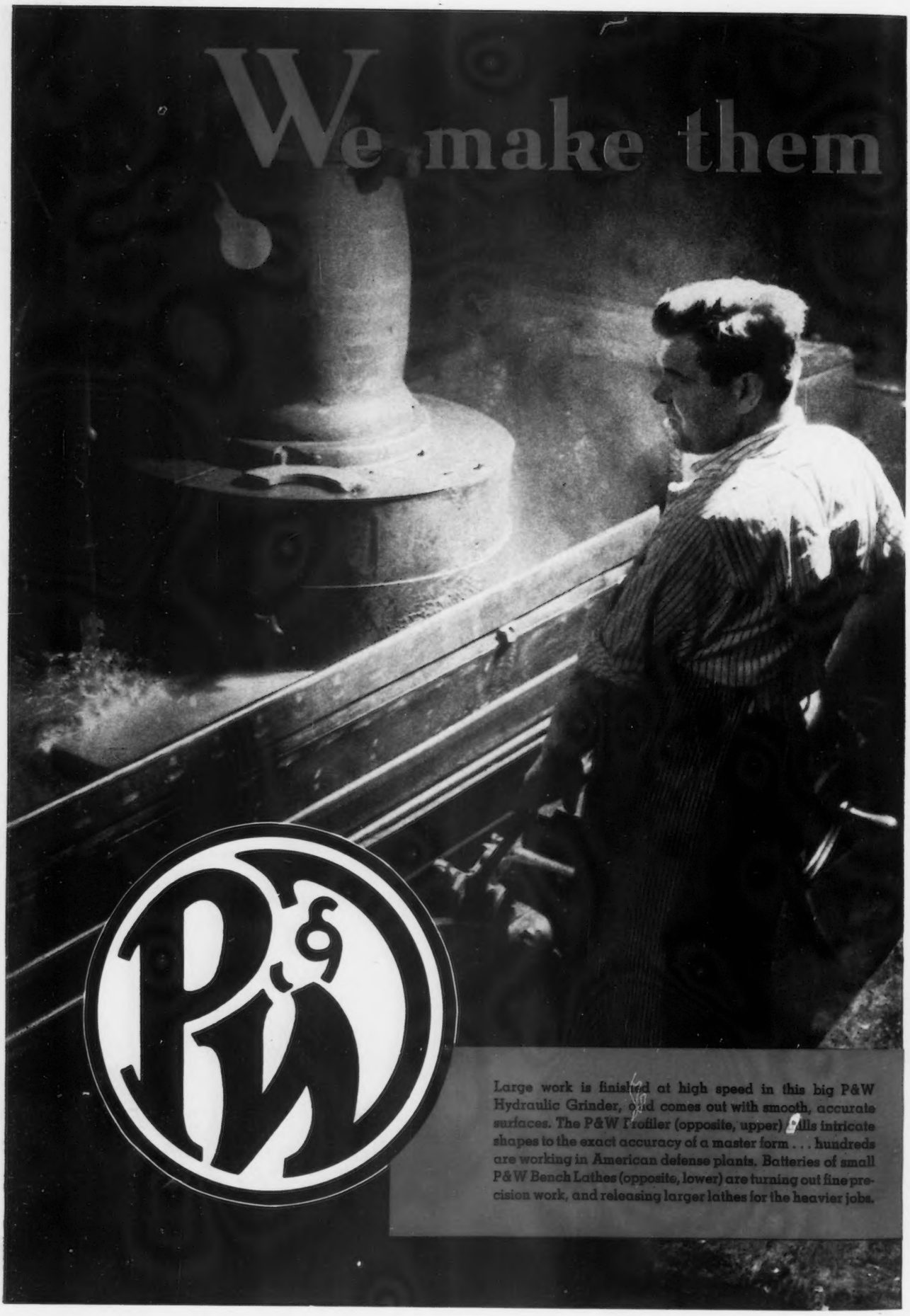

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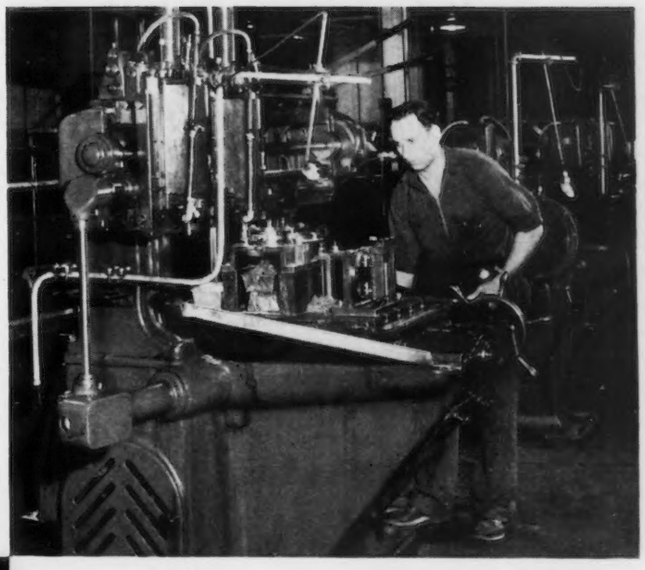

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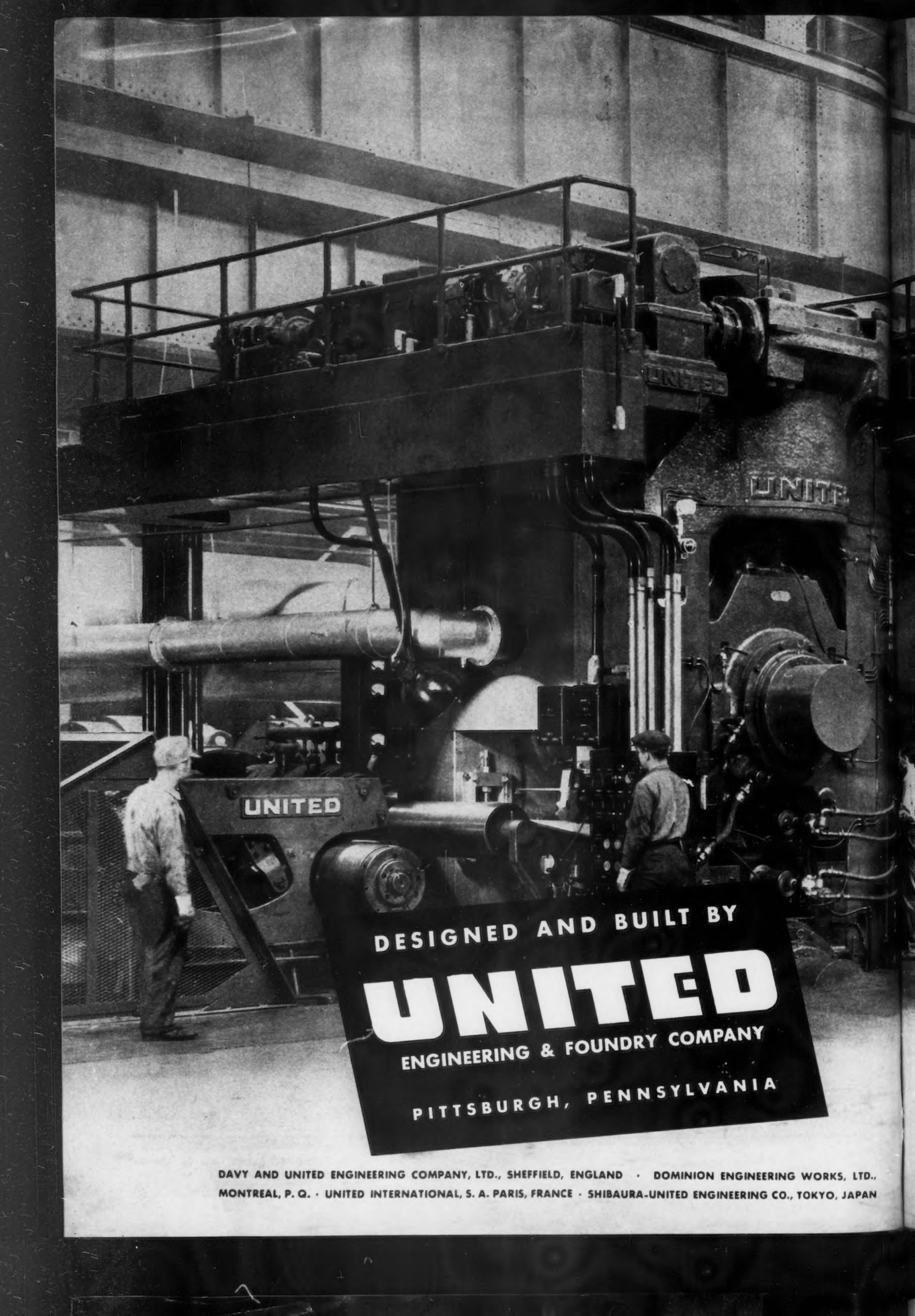

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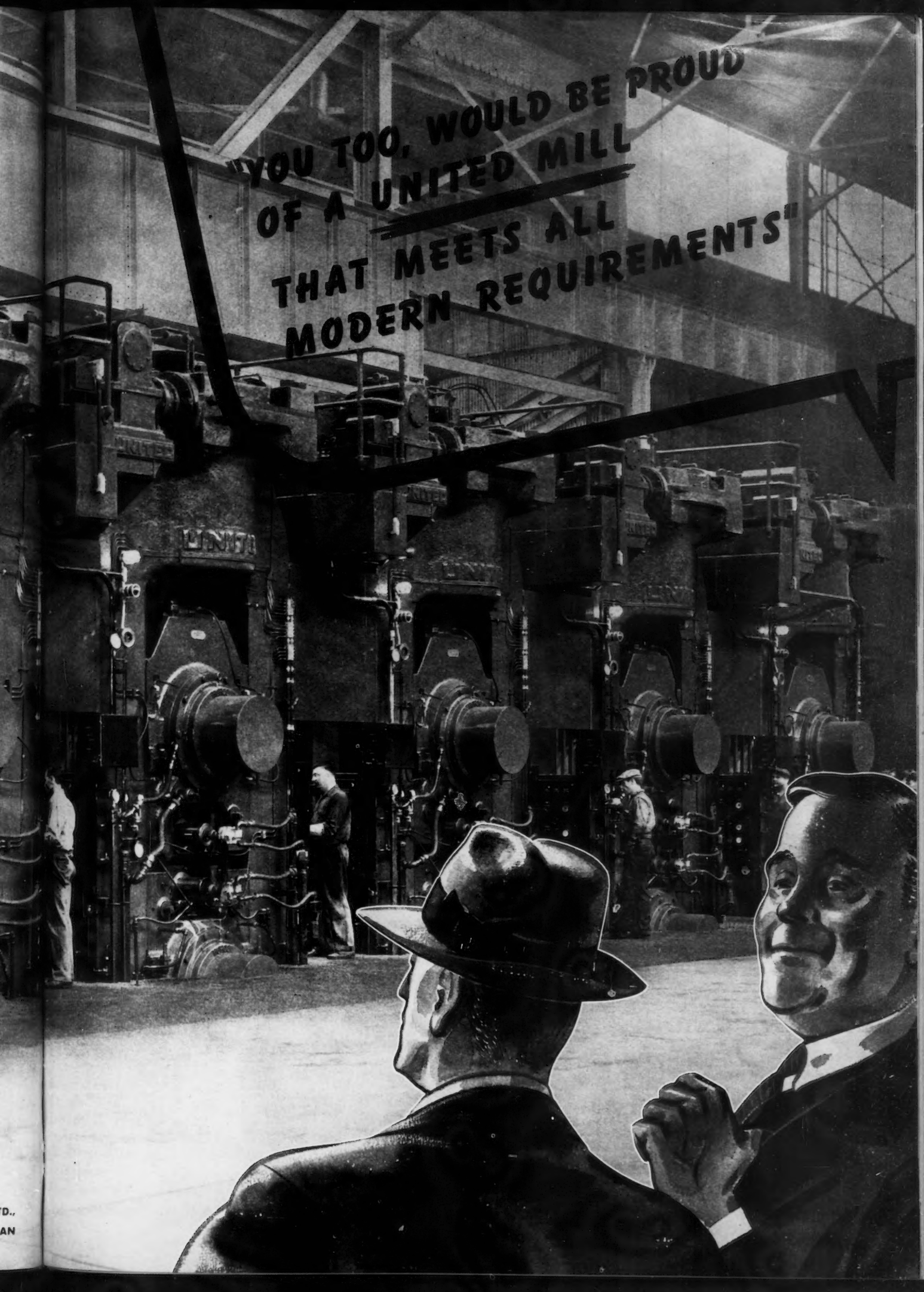
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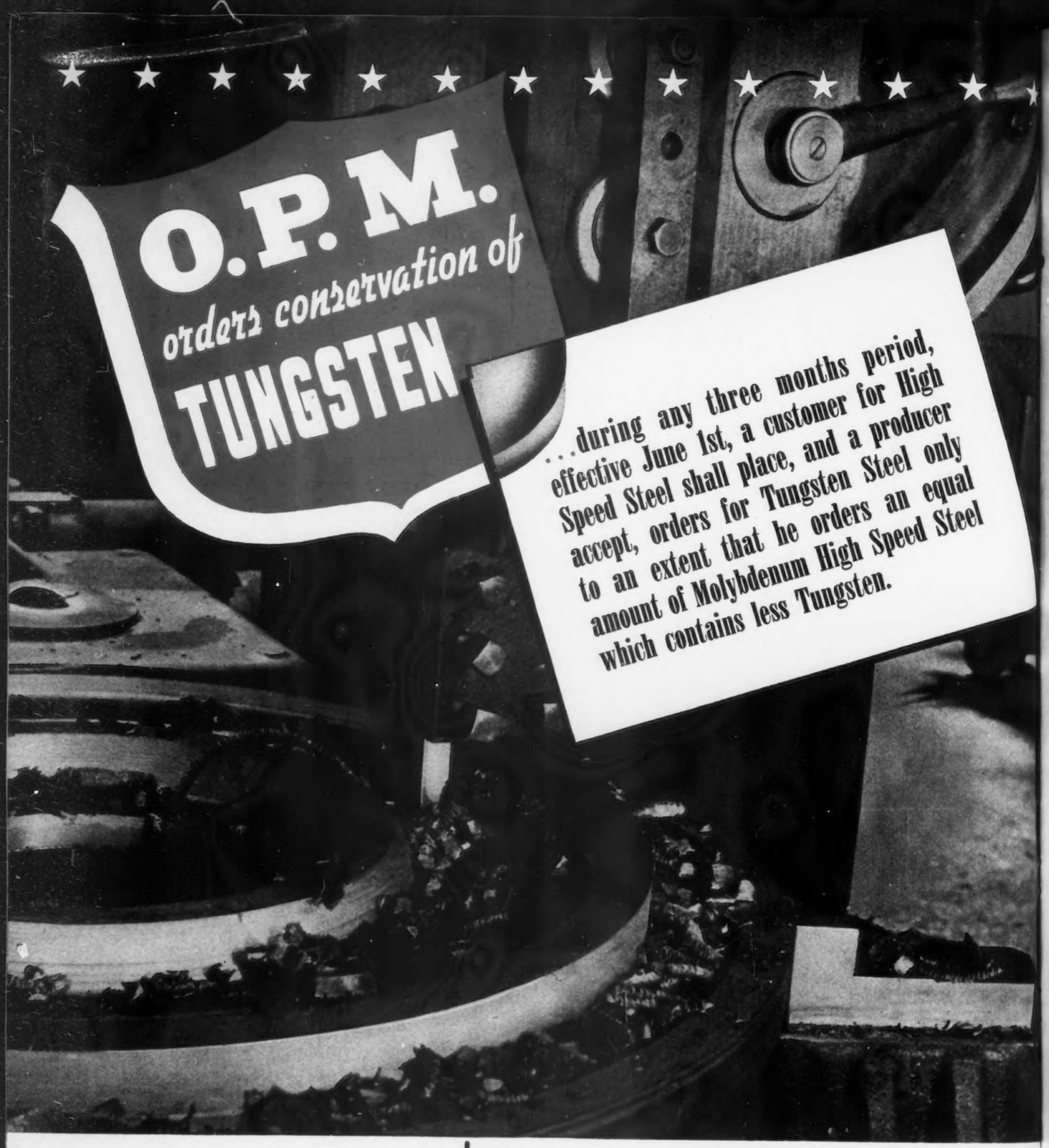
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Crucible has prepared technical pamphlets on REX VM, REX MM and REX TMO containing complete heat treating data. Write for these pamphlets and have the facts on hand for ready reference.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

... And Crucible is prepared

TO COOPERATE WITH ESTABLISHED REX HIGH SPEED STEELS OFFERING MAXIMUM CONSERVATION . . .

Realizing the future strategic importance of Molybdenum High Speed Steels, Crucible started many years ago to develop, test and gradually introduce them to the trade. The O. P. M. order, therefore, finds Crucible prepared to help you cooperate in the interests of national defense by offering you the following three established grades:—

REX VM (8% Mo, 4% Cr, 2% V, .85 C), is primarily recommended for twist drills, taps, hack saws and slitting saws. It is also suitable for lathe, planer and boring tools, chasers, reamers, hobs and milling cutters. *This grade contains no Tungsten.*

REX MM (5.50% W, 3.75% Mo, 4% Cr, 1.50% V, .80 C), is the general-purpose substitute for Rex AA and is recommended for lathe, planer and boring tools, reamers, hobs, milling cutters, drills and taps.

REX TMO (1.50% W, 8.75% Mo, 3.75% Cr, 1.10% V, .80 C), is recommended for twist drills, taps, lathe, planer and boring tools, reamers, hobs and milling cutters.

Let Crucible Help You Change Over

Get in touch with your nearest Crucible office immediately. Ask them to send you a Crucible Steelman to explain the application of the O. P. M. order to your steel requirements. Let the Crucible Steelman show you how one or more of these three grades, REX VM, REX MM or REX TMO, will enable you to maintain your continuous flow of vital production . . . without time-consuming experiments or interruptions.

Call Crucible today!

SPECIALTY STEELSMITHS to INDUSTRY

CRUCIBLE STEEL COMPANY of America

CHRYSLER BUILDING • 405 LEXINGTON AVENUE • NEW YORK CITY
BRANCHES, WAREHOUSES AND DISTRIBUTORS IN PRINCIPAL CITIES

MAKERS OF HIGH SPEED, TOOL, STAINLESS, ALLOY, PRODUCTION AND SPECIAL PURPOSE STEELS

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The high quality of Cramp products is due to sound engineering practice, correct materials, and the trained craftsmanship which enters into every step in manufacture.

For more than half a century Cramp has served American industry.

Today, Cramp's products include: castings of Parsons' Manganese Bronze, Super Strength Bronze, P. M. G. Metal and other miscellaneous casting alloys such as Gun Metal, Phosphor Bronze and Red Brass.

BLW
THE BALDWIN GROUP

CRAMP BRASS & IRON FOUNDRIES

DIVISION OF THE BALDWIN LOCOMOTIVE WORKS
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Other Members of the Baldwin Group • THE BALDWIN LOCOMOTIVE WORKS
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BALDWIN DE LA VERGNE SALES CORP. • THE WHITCOMB LOCOMOTIVE COMPANY
THE MIDVALE COMPANY • STANDARD STEEL WORKS DIVISION

PRODUCTION WELDING AT A PROFIT—

Specify

G-E Production-labeled Electrodes

THE success of G-E electrodes as an aid to effective, high-speed metal fabrication and repair is due to high-quality deposition that's *fast* and *dependable!* That's what welding operators are getting these days with G-E electrodes.

In every industry that uses welding—operators find that the improved line of G-E electrodes gives them increased production, because their time can be spent in *welding*, rather than re-welding rejects and chipping and chiselling spatter from the work. The high deposition efficiency and usability, characteristic of the G-E line of electrodes, makes "pressure" production schedules seem like regular runs.

No matter what mild-steel you're welding, whether you're using a-c or d-c welders—you'll find the answer to your demands for maximum rate of deposition and highest-quality work dependably supplied by G-E electrodes.

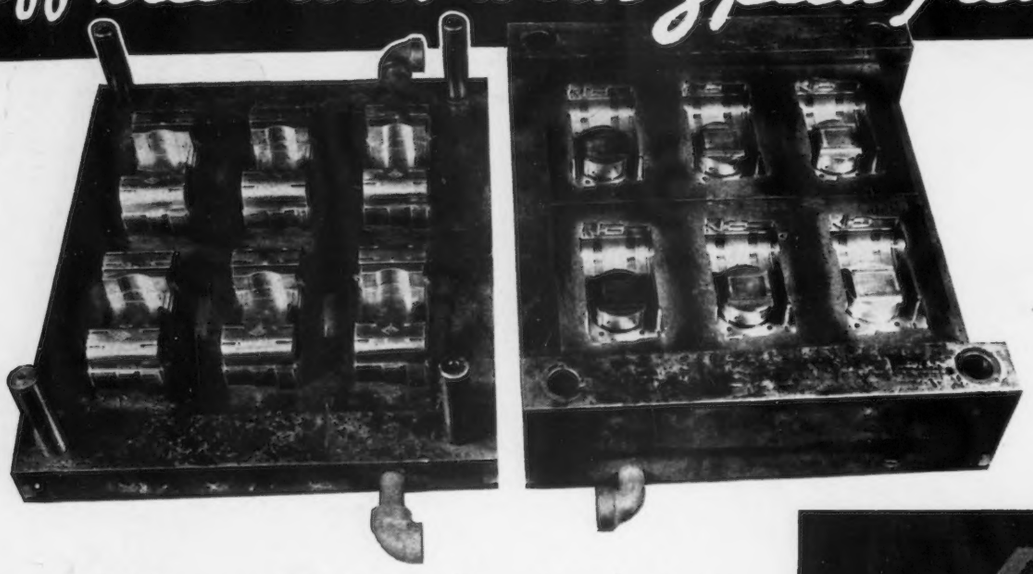
As a further aid to cutting your welding costs, we label each 50-lb carton of mild-steel electrodes with production data: ***estimated footage obtainable*** from each carton, on typical fillets, and the ***estimated weight of metal obtainable.*** This enables you to make more accurate estimates of welding costs, of the footage available from electrode stocks, and the pounds needed for any job. No more guessing — no more shortages or overages on your welding estimates.

Special localized service on your welding requirements is available from your G-E arc welding distributor or G-E office. No obligation or cost to you for free samples or demonstration. Just phone or write. General Electric, Schenectady, New York.

Production data is available on heavily-coated, mild-steel electrodes, "all-position" types, W-20, -22, -25, -30 (⅛- to ¼-in. dia.) and "flat-position" types, W-23 and W-24 (¼-in. to ⅜-in. dia.). Data on other sizes on request.

GENERAL ELECTRIC

"We knock days off mold machining time and dollars off steel costs with Speed Treat"



reports Chicago Molded Products Corp.

By using pack hardened *Speed Treat* Steel Plate (X1545) for the stripper plates and a moly steel for the molds only, this pioneer plastics molding firm has greatly reduced machining time and steel costs as well.

Instead of using a hard-to-machine steel throughout, the stripper plates are made of free machining *Speed Treat* with the machined mold keyed to the plates.

Speed Treat has high tensile strength, resistance to impact and abrasion, assures minimum distortion in machining and heat treating, has a fine finish as machined, greatly increases tool life, machines at 135-145 s.f.p.m.

Speed Treat is ideal for plastics and rubber mold and die-casting die work because it withstands constant temperatures up to 700° without checking.

It responds readily to any heat-treating that can be applied to .30-.40 or .40-.50 carbon steel and has the additional advantage of being water quenched. *Speed Treat* can be flame hardened, forged and welded. Many mold and die shops have found it expedient to make the entire mold of *Speed Treat* (X1545) or *Speed Case* (X1515) with satisfactory results, not only because of the lower cost and the shorter time element involved in their use, but because of the growing inaccessibility of high alloy steels.

Speed Treat is saving money for scores of die and mold shops as well as producers of die shoes, grinding wheel discs for backing up abrasives, motor generator housings, abrasive blast cleaning equipment and many others. Get the complete facts in "The Story of *Speed Treat*" sent on request.

You can change, repair or rebuild molds and dies of *Speed Case* or *Speed Treat* by welding. While other electrodes can be used successfully, *Speed Case* and *Speed Treat* rods are particularly recommended. A bulletin explains the technique, step by step.

A plastics mold gouged out by mistake, in machining, is shown here with the cut partly restored by welding. Repairing and machining was only a fraction of the cost of a new mold. Welding by Bulaw Welding Co. of Chicago, for a Milwaukee firm.

SPEED TREAT FREE MACHINING MEDIUM CARBON STEEL PLATE

Quality Controlled *Speed Case* and *Speed Treat* Steels are available in all common plate sizes, hot rolled and cold finished bars and billets.

W. J. HOLLIDAY & CO.

Established 1856

HAMMOND, IND. CHICAGO, ILL. INDIANAPOLIS, IND.

Distributed by

Beals McCarthy & Rogers, Buffalo, N.Y. — **Horace T. Potts Co., Philadelphia, Pa.** — **Brown-Wales Company, Boston, Mass.** — **The Burger Iron Company, Akron, Ohio**

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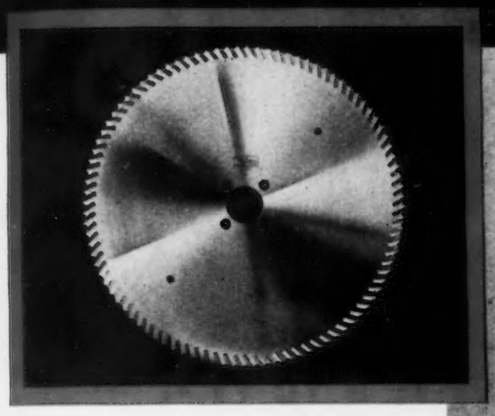
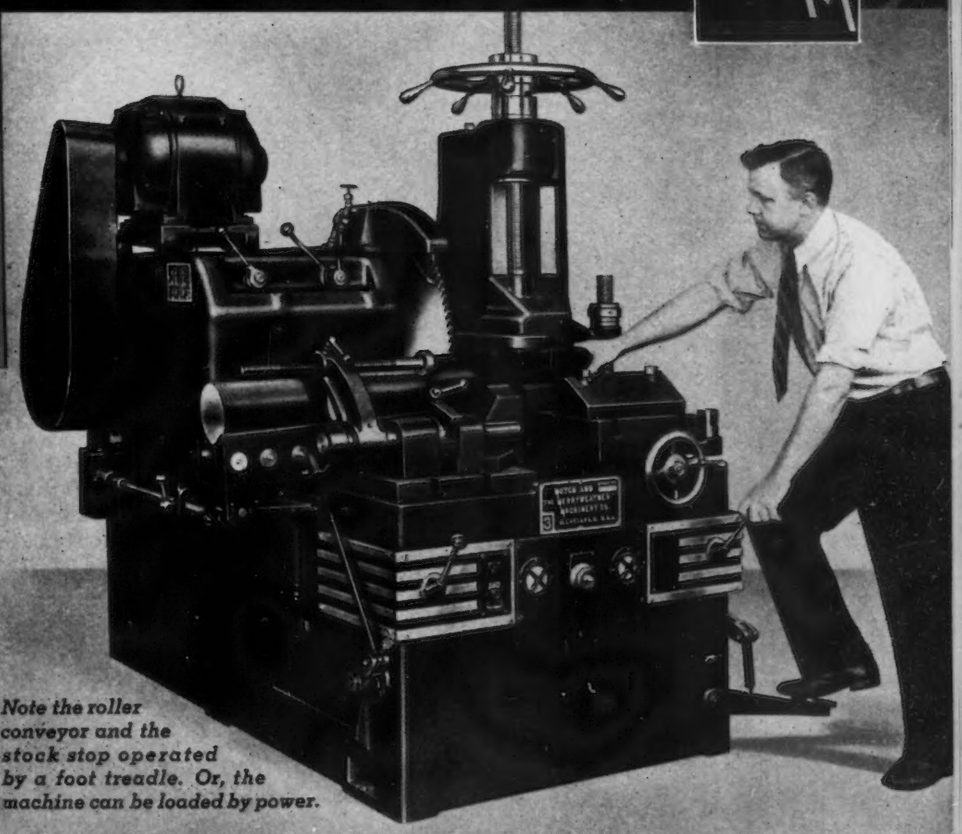
ONE MAN OPERATING 3 MOTCH & MERRYWEATHER COLD SAWING MACHINES ON 4½" ROUND SHELL STEEL AVERAGES 4320 SLUGS PER 24-HOUR DAY WITHOUT SCRAP SLUGS, WITHOUT BURRS, AT AN EXCEEDINGLY LOW COST . . . . . .



To insure the best results, use M & M Saw *Blades* with the M & M Cold Saw. Blade features are: reinforced teeth radially ground to lengthen intervals between sharpenings; high grade tool steel segments fitted to heat-treated center; tooth pitch suiting any material; segments forming closed ring to stiffen blades; blade can be reset with new segments without lessening diameter.

* * *

For longer service, sharpen your blades on the Motch & Merryweather Saw Grinder. Features: rigidity—no overhang, no chatter, no vibration; automatic indexing; dust-proof drive; easily grinding high and low teeth; all operating controls actuated while running.



Note the roller conveyor and the stock stop operated by a foot treadle. Or, the machine can be loaded by power.

"Easy on the man." Just set the machine and feed the stock—that's all your operator has to do—and from one position at that—thanks to the features shown above. Speed? Plenty of it, *with accuracy and certainty*—no back-tracking, no lost motion, no slugs to throw away. A cut every minute—clean, sheer, and burrless. Get all the facts about this amazing performer, especially on shell slugs and like exacting work.

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING :-: CLEVELAND, OHIO

MOTCH AND MERRYWEATHER THE MACHINERY CO
CLEVELAND CINCINNATI DETROIT PITTSBURGH

Ask for our illustrated story of the Motch & Merryweather Cold Sawing Combination

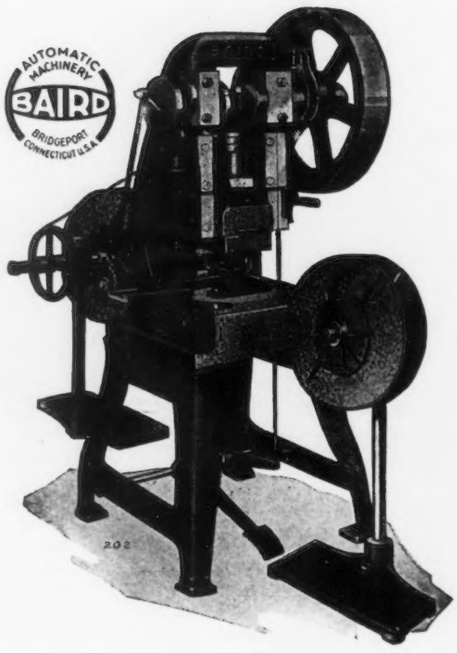
Built by **MOTCH & MERRYWEATHE**

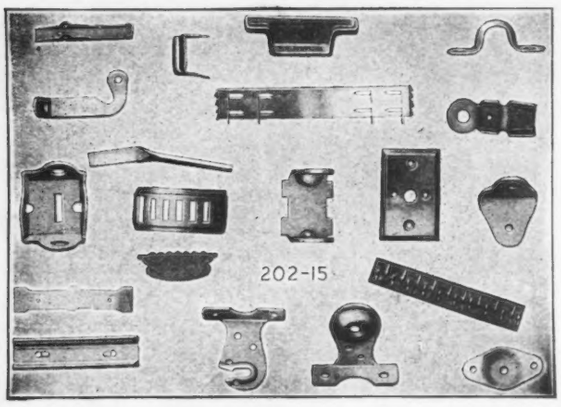
BAIRD AUTOMATIC PRESSES . . .

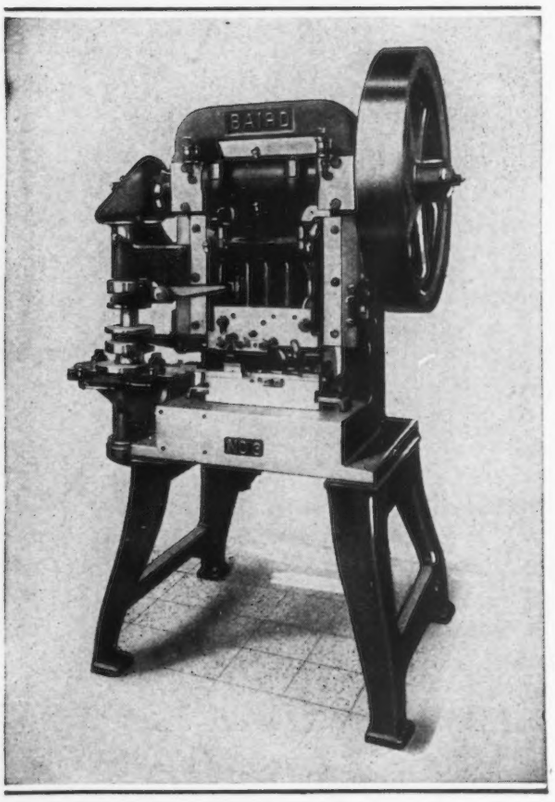
Herewith are shown two types of Baird Automatic Presses for large quantity production. The one to the right is a Standard Heavy Single Action Open Back Press with readily removable and readily attachable automatic attachments, in this instance a single station transfer.

Many manufacturers using automatic machines elsewhere in the shop are overlooking the benefits of the automatic principle in their press departments. For constructive suggestions leading toward betterment of press production we invite such manufacturers to

"Ask BAIRD About It"







AUTOMATIC MULTIPLE TRANSFER PRESSES

The latest of the many Baird achievements is the Automatic Multiple Transfer Press for the automatic production of articles from the coiled material.

Transfer fingers not only transfer the blank to various stations, but they also retain their grip until the punches make contact.

Machines have been arranged with different types of feeding mechanism, strokes for slide, stroke for transfer to best suit the article to be made.

All punches have independent adjustments. The punches, dies, transfer slide and fingers constitute a unit which may be removed from the press *in a very few minutes.* This important feature eliminates time-consuming tool set-ups when changing over from one job to the next.

Over 60 years of Baird engineering skill and experience are embodied in this new Automatic Multiple Transfer Press which is built in six sizes to take strips 1½" to 6" in width. Get the full details of this new development.

"Ask BAIRD About It"

THE BAIRD MACHINE COMPANY
BRIDGEPORT, CONN.

BAKER TRUCKS speed handling at *North American*

North American B-25 Twin-engine Bomber dressed in camouflage paint of the United States Army Air Corps.

Above: Baker Trucks removing a die from one of the drop-hammers with the use of a winch. Same truck quickly carries die to storage area.

Above, right: Baker Trucks picking up one of hundreds of heavy dies used in North American's drop-hammer department.

Below: Aerial view of North American Aviation's huge Inglewood, California factory. Vast areas and heavy handling operations of aircraft plants emphasize the need for Baker Trucks.

● Geared for highest efficiency in turning out fighting planes for the United States and Great Britain, the huge modern plant of North American Aviation, Inc., at Inglewood, California, uses every available means for stepping up production. Baker Trucks are called into service in the busy drop-hammer department, where they make short work of removing and installing heavy dies, carrying them rapidly to and from the outside storage area.

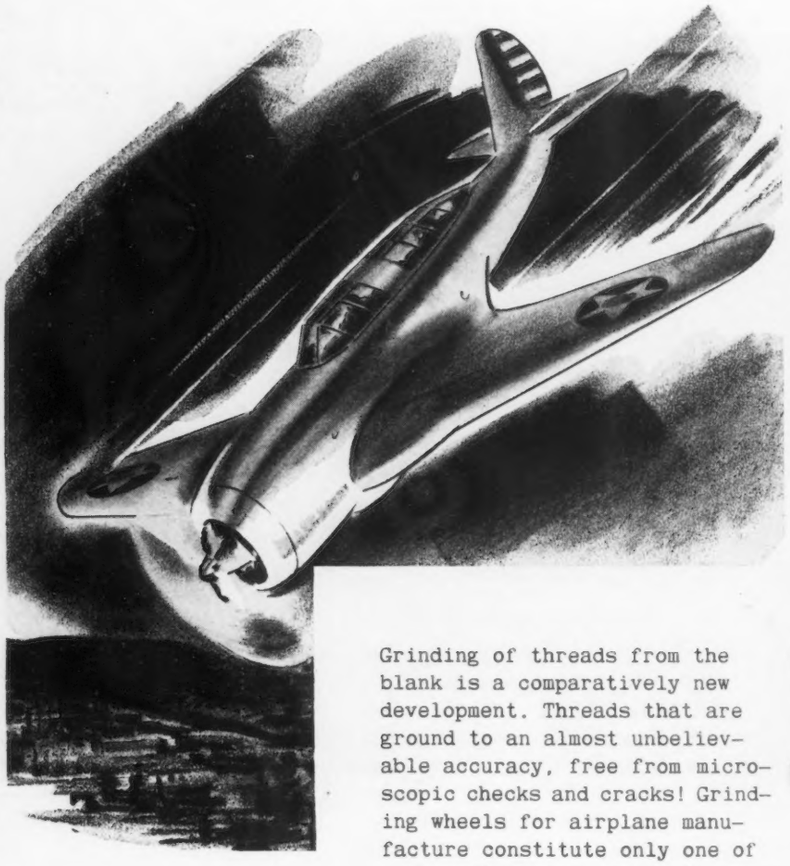
BAKER INDUSTRIAL TRUCK DIVISION
of THE BAKER-RAULANG COMPANY
2175 WEST 25th STREET • CLEVELAND, OHIO

TRADE MARK REG. U. S. PAT. OFF.

In Canada: RAILWAY AND POWER ENGINEERING CORPORATION, LTD.

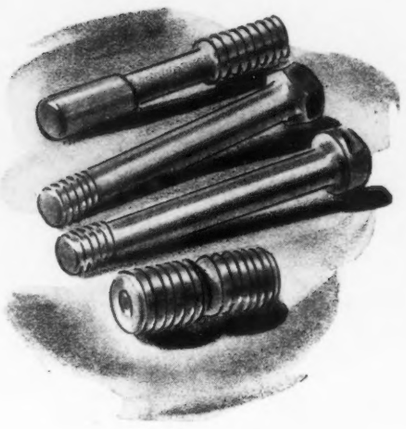
Baker INDUSTRIAL TRUCKS

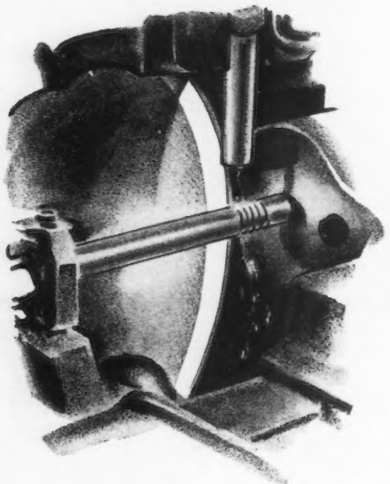
What holds a dive bomber together at 500 M.P.H.?



The answer is design and construction and materials and craftsmanship. But accuracy and finish of parts are also important in building a plane to withstand terrific speeds and that depends on grinding. Vibration is minimized by grinding all moving parts of the power unit to extreme accuracy. Safer and stronger threaded parts are ground with special grinding wheels such as are made by The Carborundum Company.

Grinding of threads from the blank is a comparatively new development. Threads that are ground to an almost unbelievable accuracy, free from microscopic checks and cracks! Grinding wheels for airplane manufacture constitute only one of many contributions made to industry by Carborundum during its fifty-year existence.





Carborundum manufactures and can specify the right wheel for every grinding job. And Carborundum engineers will gladly show you the best methods of using these wheels for higher production, improved quality of work and lower costs. Write The Carborundum Company, Niagara Falls, N.Y.

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.

CARBORUNDUM
REG. U.S. BRAND PAT. OFF.
ABRASIVE PRODUCTS
50 YEARS OF SERVICE TO ALL INDUSTRY

As changing consumer demands impose more exacting requirements upon production, users of Weirite Tin Plate and allied steels find the Weirite trade-mark a symbol of continuously satisfactory quality . . . a quality that assures better performance on *your* production line, and keeps Weirton in its unchallenged position as the world's largest independent tin plate producer.

LIST OF PRODUCTS

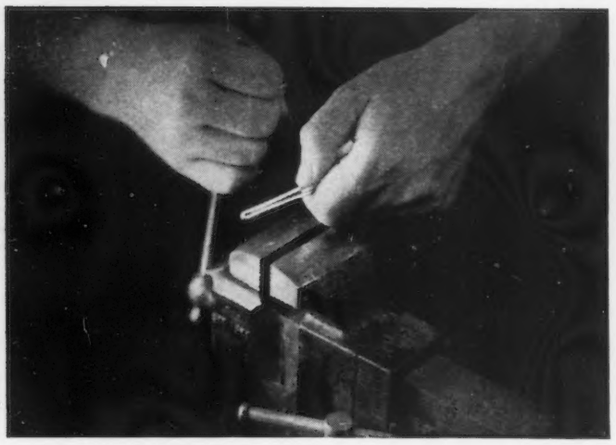
Bars . . . Angles . . . Structurals . . . Piling . . . Hot and Cold Rolled Strip . . . Hot and Cold Rolled Sheets . . . Galvanized Sheets . . . Long Terne Sheets . . . WEIRITE Cold Reduced Tin Plate . . . Terne Plate —Special Coated and Roofing Ternes . . . Tin Mill Black Plate . . . Lacqured Tin Plate and Black Plate.

WEIRTON STEEL COMPANY—WEIRTON, WEST VIRGINIA

Sales Offices in Principal Cities

division of NATIONAL STEEL CORPORATION

Executive Offices, Pittsburgh, Pa.



A hairpin bend...
a pigtail twist...
a 90% area reduction

They won't harm a bethanized coating

Have you ever thought about bethanized wire . . . and your product . . . and wondered if you couldn't combine them profitably?

If you now make a product out of uncoated wire, and apply the zinc after fabrication to avoid flaking or peeling, then bethanized wire can save you both time and money. Users of bethanized wire have found that the bethanized zinc coating is flake-proof under virtually any commercial forming operation. You can bend bethanized wire flat back upon itself, twist it into a pigtail, draw it through dies to a fraction of its size, without harming the zinc coating in any way or reducing the percentage of zinc to steel.

The secret of this unusual tightness and ductility lies in the bethanizing process itself. The zinc is applied to the wire by an electric current. There is no in-between layer of zinc-iron alloy. The coating is 99.9+ per cent pure, ductile as gold leaf, and uniform in thickness both along and around the wire. Furthermore, the bethanizing process can apply virtually any weight of zinc within practical limits. Standard bethanized "B" and "C" coatings are twice and three times as heavy as specifications call for in a standard double galvanized coating.

Get the facts on bethanized wire by writing to Bethlehem Steel Company, Bethlehem, Pa. We'll send you a descriptive folder, covering manufacture, properties and uses. No cost or obligation involved.

BETHANIZED WIRE

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

B&W Insulating Firebrick have stability under the conditions in which this characteristic has real meaning—when the brick are HOT.

Cold crushing strength is not indicative of the stability of a brick *in service*. Ability to withstand furnace temperatures without deformation is the important characteristic—this is usable, effective strength.

Because they have stability under heat, coupled with the lightest possible weight, B&W Insulating Firebrick provide long service life and high thermal efficiency.

THE BABCOCK & WILCOX COMPANY **Refractories Division** **85 Liberty Street, New York, N. Y.**

R-124

BABCOCK & WILCOX

MODERN STEEL MAKES THE DIFFERENCE

Without steel our wives would have few advantages for food preparation over their great-grandmothers, or even the Indian squaw at her rude campfire.

For as Mrs. America of 1941 surveys her modern kitchen she finds her every want anticipated. Refrigerator, range, sink, cabinets, pots and pans, even the walls of colorful tile--all designed for beauty, labor-saving convenience and economy--are fabricated of enameling sheets surfaced with lustrous glass-smooth, easy-to-clean porcelain. Thus has modern steel brought increased efficiency, comfort and leisure into the American home.

For more than forty years a leading producer of sheets for fabricators, Youngstown has aided this revolution in home standards. Today, in a national emergency, Youngstown is contributing its best to home defense--furnishing materials for national rearmament, as well as supplying steel for fabrication to protect the American standard of living.

QUALITY YOUNGSTOWN SERVICE

Sheets - Plates - Bars - Pipe and Tubular Products - Conduit - Tin Plate - Rods Wire - Nails - Tie Plate and Spikes

YOUNGSTOWN

Manufacturers of Carbon, Alloy and Yoloy Steels

THE YOUNGSTOWN SHEET AND TUBE COMPANY

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25-23D

FOR *Emphasis* ON SPEED! ... USE SIMPLIMATICS

Look ahead...
keep ahead...
with Gisholt Improvements
in metal turning

THEY'LL give you higher speed, of course! But also, their automatic operation has been so simplified that no particular skill is required to machine parts in larger quantities—within close limits of accuracy, and with fine finish.

Now, and in the busy years ahead, these Gisholt Simplimatics will take over more and more of the large-volume machining jobs—to release skilled hands and machines for other important work. It's a trend that is sound and inescapable.

It's high time to be thinking about these things—to be planning the faster, more efficient production that will reduce your manufacturing costs. Where quantities of parts run sufficiently large, Gisholt Simplimatics offer you many economies.

Gisholt engineers will gladly advise you.

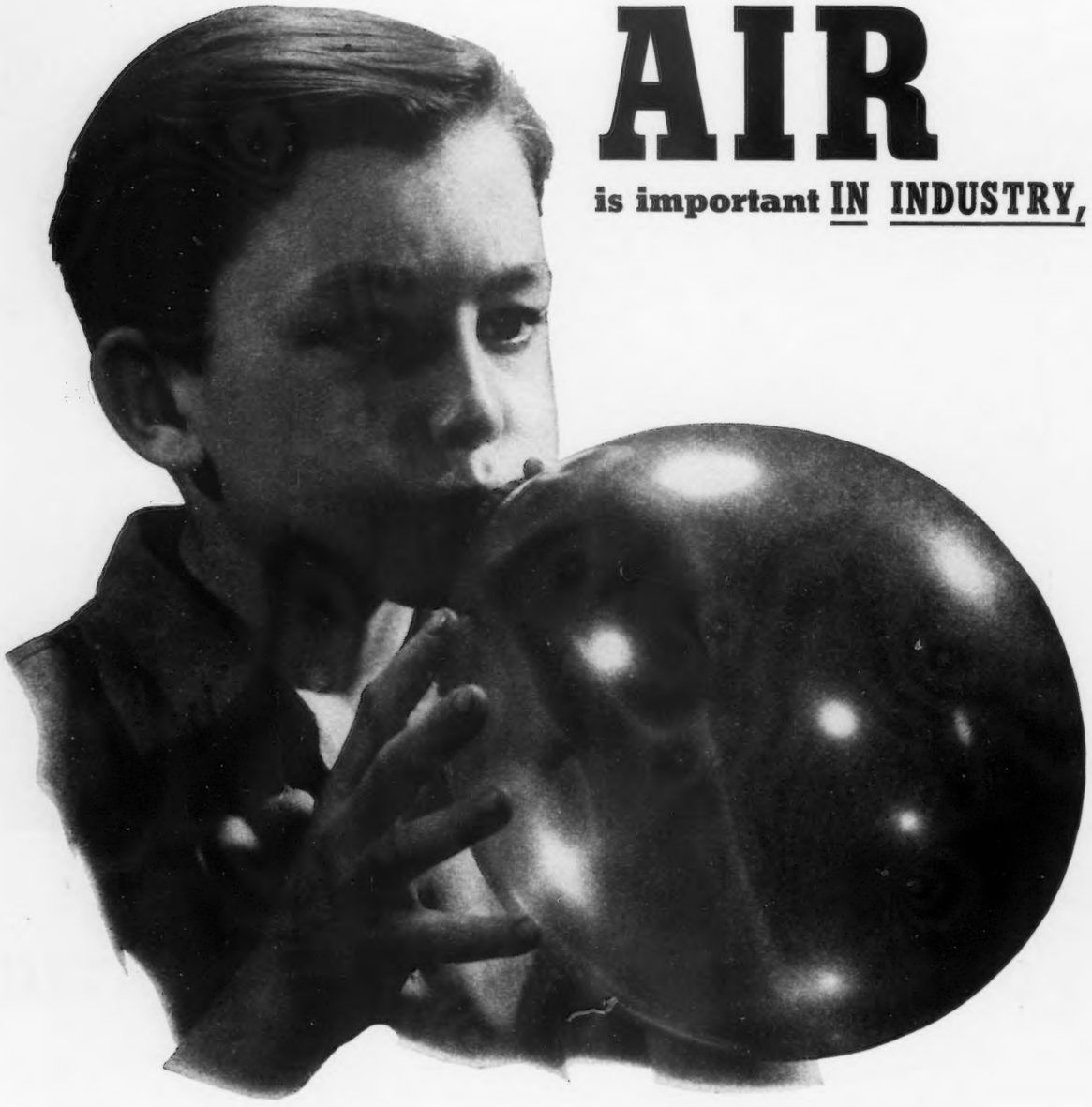
GISHOLT

GISHOLT MACHINE COMPANY • **1215 E. Washington Ave., Madison, Wis.**

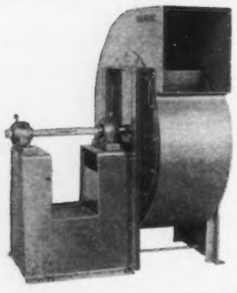
TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

AIR

is important IN INDUSTRY, TOO



AIR for industrial man-power, AIR for modern industrial processes is today more important than ever before. And today's modern American Blower Air Handling Equipment is better than ever — ready to meet every industrial need — ready to meet your particular air handling problems.



New American Blower Type E Fan, above. A high efficiency steel plate exhaust fan for industrial use. Write for Bulletin 4906.

Take the new American Blower Type E Fan shown at left, for example. It is a new high efficiency steel plate exhaust fan designed especially for industrial work. It delivers more air at lower costs and sets a new standard for trouble-free, dependable operation. And this is but one of many improved, top quality American Blower products for industry. With the finest laboratory, engineering and manufacturing facilities, and more than 60 years of experience, American Blower is ready to cooperate with you in solving all your air handling problems.

Phone or write the nearest American Blower Branch Office today or send for complete descriptive booklet of American Blower air handling products.

Remember . . . American Blower can make air work wonders in your plant!

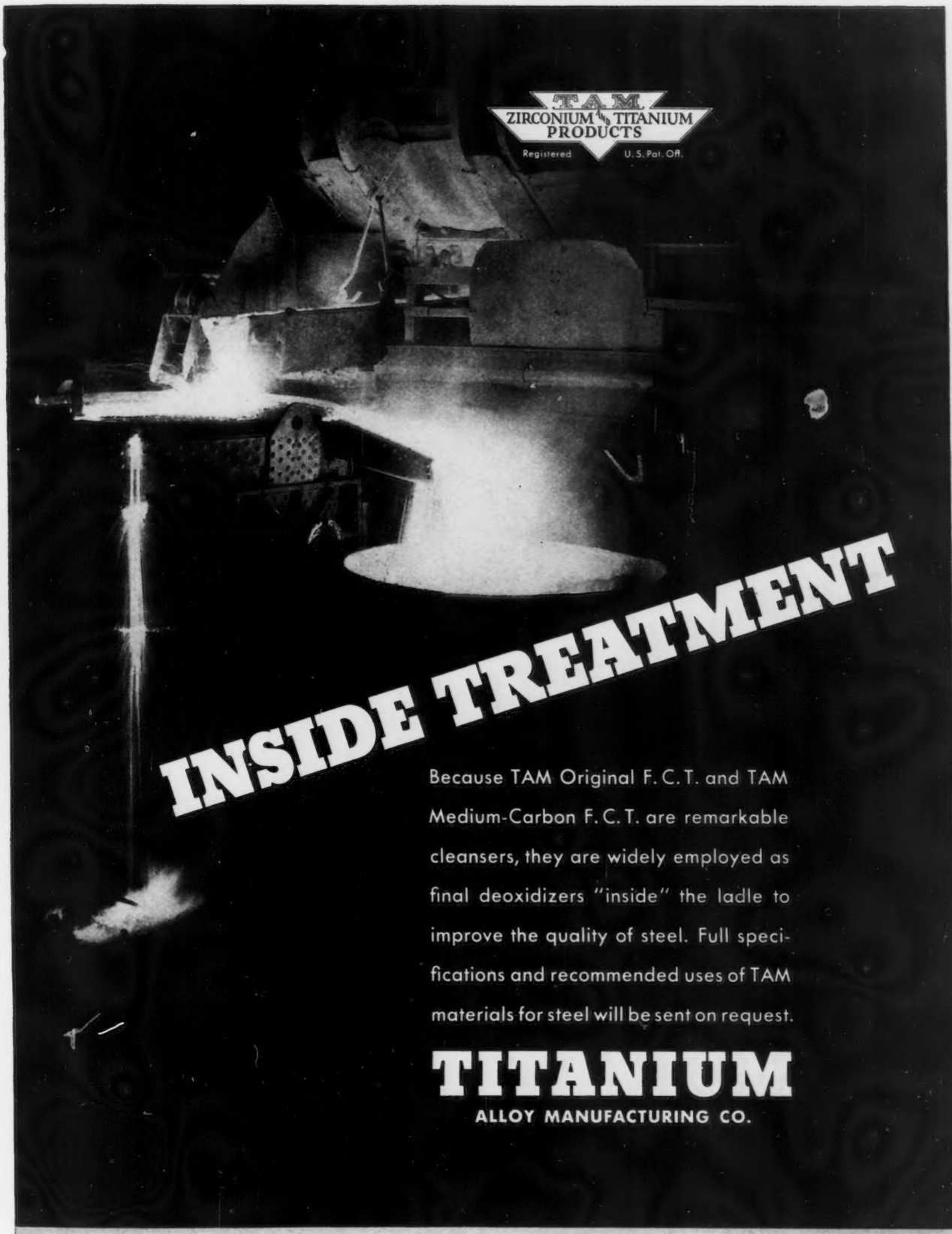
MECH. DRAFT · AIR-CONDITIONING · FLUID DRIVES · DUST COLLECTORS
AMERICAN BLOWER

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, 6000 RUSSELL STREET, DETROIT, MICH. • CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONT.

Division of American Radiator and Standard Sanitary Corporation

FANS • BLOWERS • EXHAUSTERS • DUST COLLECTORS • AIR WASHERS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ZIRCONIUM AND TITANIUM
PRODUCTS
Registered U.S. Pat. Off.
INSIDE TREATMENT
Because TAM Original F. C. T. and TAM Medium-Carbon F. C. T. are remarkable cleansers, they are widely employed as final deoxidizers "inside" the ladle to improve the quality of steel. Full specifications and recommended uses of TAM materials for steel will be sent on request.
TITANIUM
ALLOY MANUFACTURING CO.

GENERAL OFFICES AND WORKS: NIAGARA FALLS, N. Y., U. S. A.
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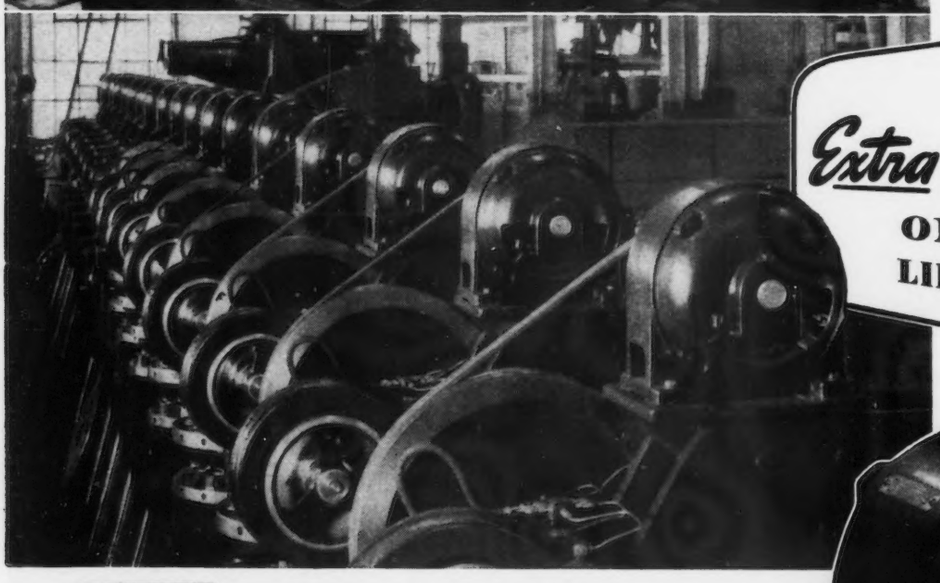
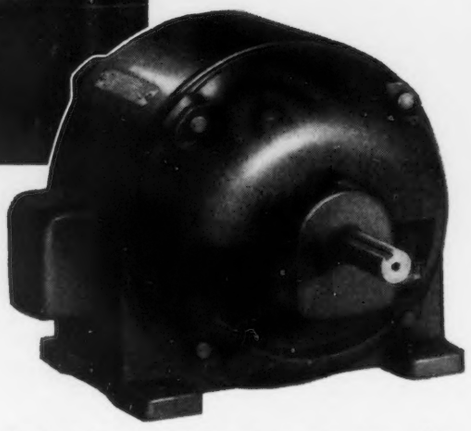
OFF THIS LINE with *Extra Protection*



for *Extra Production* ON LINES LIKE THIS!



TRI/CLAD MOTORS

REG. U.S. PAT. OFF.

POLYPHASE OPEN TYPE	***SINGLE-PHASE CAPACITOR***	***POLYPHASE SPLASHPROOF***
1-20 hp	***1-5 hp***	***1-20 hp***

We've hit our stride in the production of Tri-Clad motors—they're coming off our assembly lines in ever-increasing quantities. This fact pleases us doubly—as we think it will please you: In the first place, motors are vitally needed by hundreds of industrial concerns engaged in the defense program; and secondly, our near-peak production not only means more and more motors for American industry but better motors, too, because Tri-Clad motors embody *three* outstanding features which give additional protection for vital production:

1. **Extra Protection against Physical Damage**
2. **Extra Protection against Electrical Breakdown**
3. **Extra Protection against Operating Wear and Tear**

Specify Tri-Clad on your next order. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

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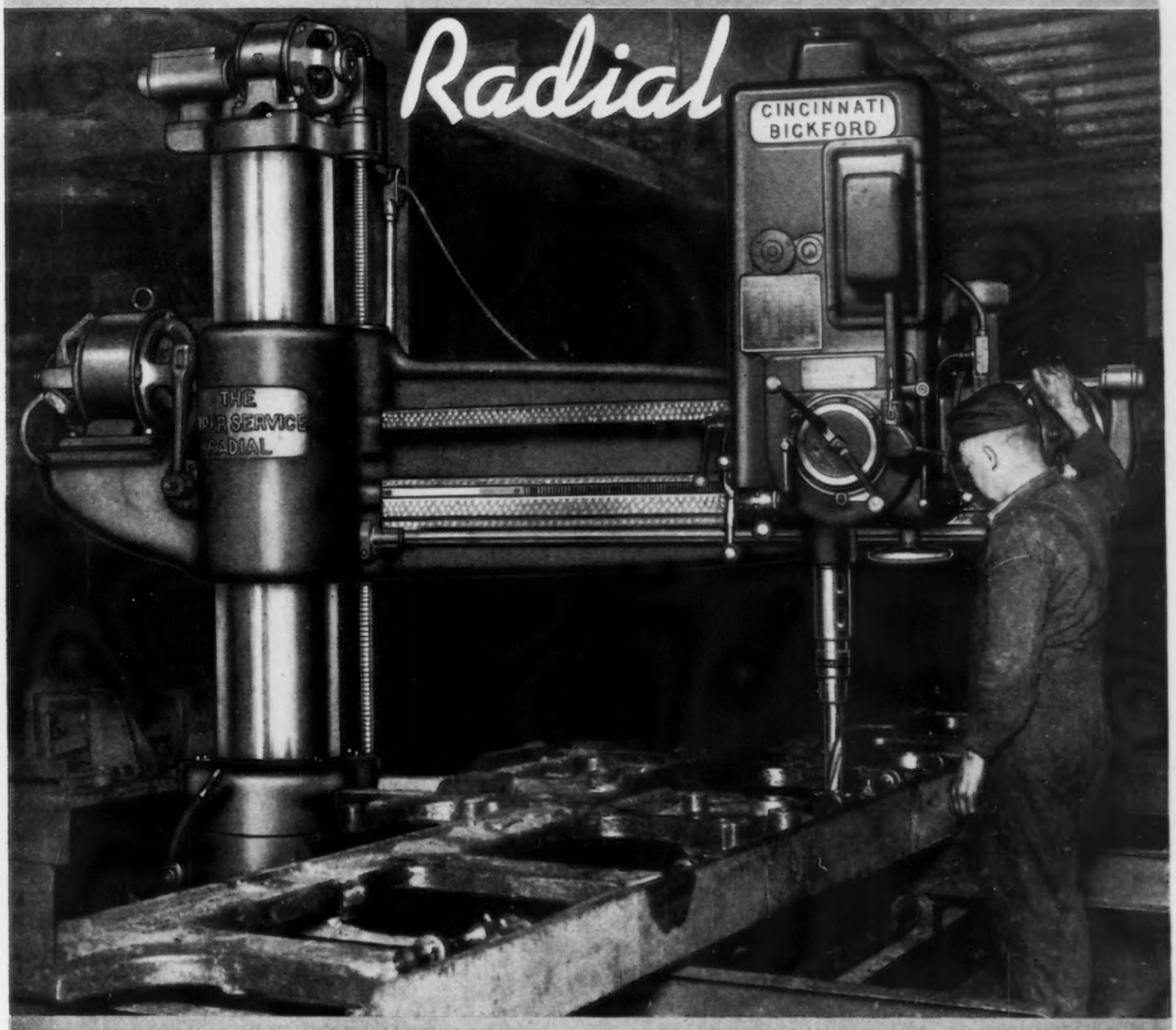
The SUPER SERVICE Radial



ON DUTY NOW!

Especially on big cumbersome work in the defense industries where centralized control at drilling positions makes important time savings.

For further information of the Super Service Radial on Upright Metal drilling machines, write us.

Learn how these machines are different from other drills of today, making it possible for you to save energy, time and money, with this 100% centralized control at the head.

THE CINCINNATI BICKFORD TOOL CO.

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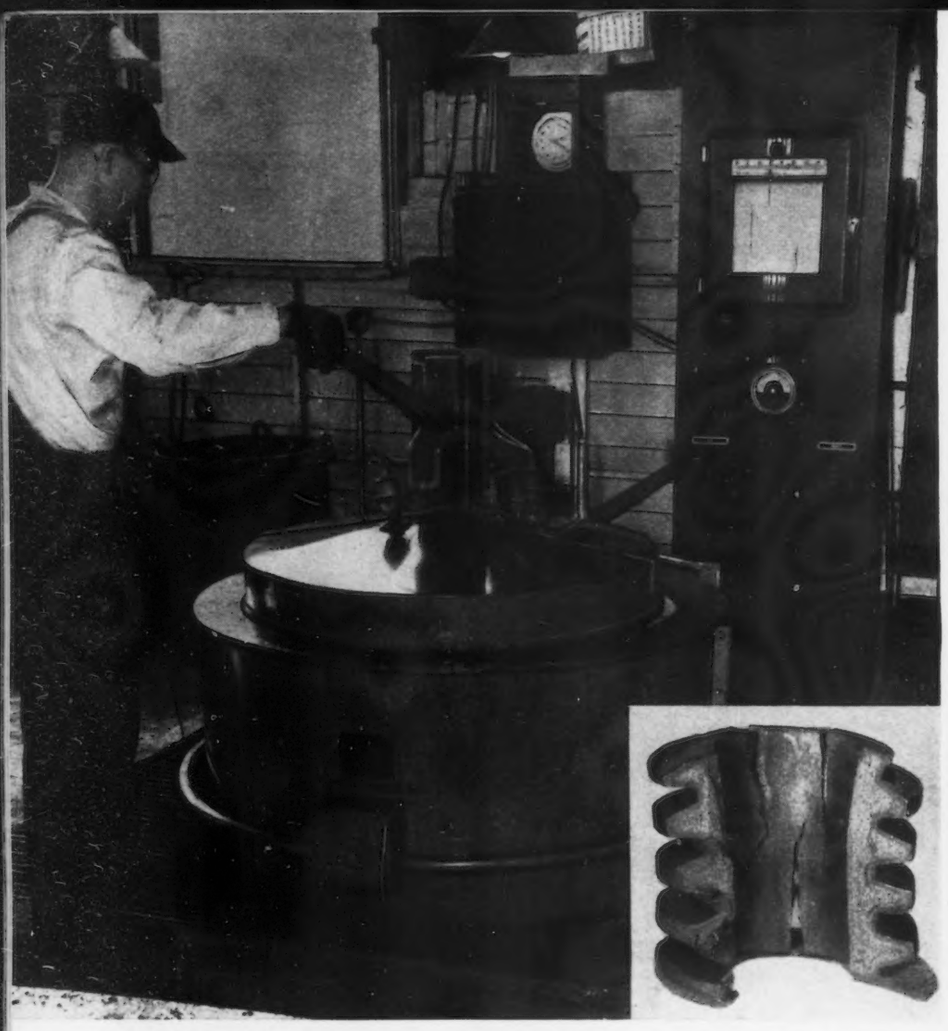


Starting to unload carburized gears from Homo Tempering Furnace, at Boston Gear Works, Quincy, Mass. Insert is gear after tempering, split apart to show structure.

"BOSTON" GEARS DRAWN FASTER, And Better . . . The Homo Way

High-quality, mass-production tempering is of course not new to Boston Gear Works Inc. In making their carburized gears they long ago conquered the problems involved. But . . . tempering was never so accurate, so economical or so fool-proof as it became with the use of their *Modern* Homo Method equipment. Boston Gear finds four specific advantages:

1. Tempering is done 50 degrees lower than by their previous method because the Homo's uniform heat makes it unnecessary to overheat some gears in order to be sure of adequately heating the others. Result is greater and more uniform hardness of gears.

2. Uniformity is so high that a very considerable amount of inspecting is eliminated, and re-running is unknown. Result is faster production.

3. Gears are clean and dry when tempered; there's no washing, no expense for oil; no oil fumes or hazard. Results are lower cost and better working conditions.

4. No furnace repairs for months at a time, and then they are minor; "Equipment can certainly take it." Result is that production schedule is held with ease.

See Catalog T-625 for description of Modern Homo Method equipment.

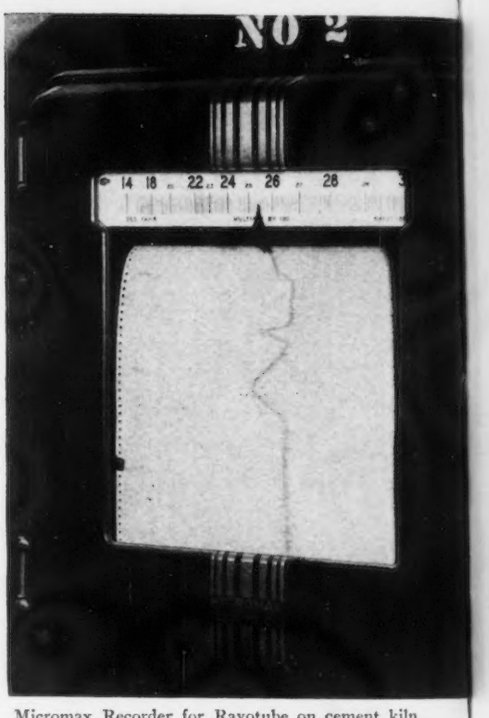
Cement Makers Show Other Users of Rotary Furnaces How To Get Better Control

In commenting on its temperature-control system, the Southwestern Portland Cement Co. has, we think, written something which will interest many other users of rotary furnaces. The high temperature (2700 F) of their burning zone, plus the inevitable dust, plus the enormous size of cement kilns (400 feet long in many cases) combine to create service conditions which instrument-makers call severe. Yet, in spite of these conditions, Southwestern writes as follows:

"We have almost entirely eliminated the guesswork and uncertainty on the part of the kiln operator, as far as temperature is concerned, by the use of Micromax recorders with Rayotubes sighted on the moving clinker.

"It is difficult for even an experienced kiln burner to distinguish a difference of fifty or a hundred degrees, at the high temperature required to burn cement clinker. This is easily accomplished, however, by the use of Rayotubes.

"Another advantage is the protection of the kiln lining. Rayotubes can't prevent all damage, but they help materially in preventing the over-heating which contributes to damage."



Micromax Recorder for Rayotube on cement kiln at Southwestern Portland Cement Co., showing record of temperature of moving clinker.

The above is no isolated case; scores of cement kilns, rotary sludge dryers, rotary heat-treating furnaces, etc., use, with fine results, Micromax recorders or controllers connected, not to the usual thermocouples, but to Rayotubes instead. And this application is by no means limited to rotary furnaces. In general, it includes controlled-atmosphere furnaces, glass tanks, open-hearths, blast furnaces, rolling mills, soaking pits, and many other services. For further information, write for Catalogs.

LEEDS & NORTHRUP COMPANY, 4956 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

Jrl Ad ENT-0600C(21) MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

PUMPS can be as great a menace to low production costs as human malcontents. Ten-year-old pumps of certain types, for instance, cost *25% more to operate* than those of today's design. In some other types, an age of *only three or four years* means obsolescence that makes continued use more costly than replacement.

Because the penalties of obsolescence are so great, today's far more efficient Fairbanks-Morse Pumps often pay for themselves in power savings *in as little as a year!* And because these improved pumps are superior mechanically too, they *retain* their efficiency longer and so continue to pay dividends in power savings long after their cost has been liquidated.

Perhaps *your* pump operating costs are so excessive that you could replace old pumps with new at a saving. Find out now, without obligation. Write Fairbanks, Morse & Co., Dept. F-38, 600 S. Michigan Ave., Chicago, Ill. Branches and service stations throughout the United States and Canada.

FAIRBANKS-MORSE BUILTOGETHER PUMPS

A complete line of highly efficient, compact, sturdy units consisting of F-M Centrifugal Pumps mounted directly on the shafts of F-M Ball-bearing Motors. No division of responsibility. Easy to install.

FAIRBANKS · MORSE PUMPS

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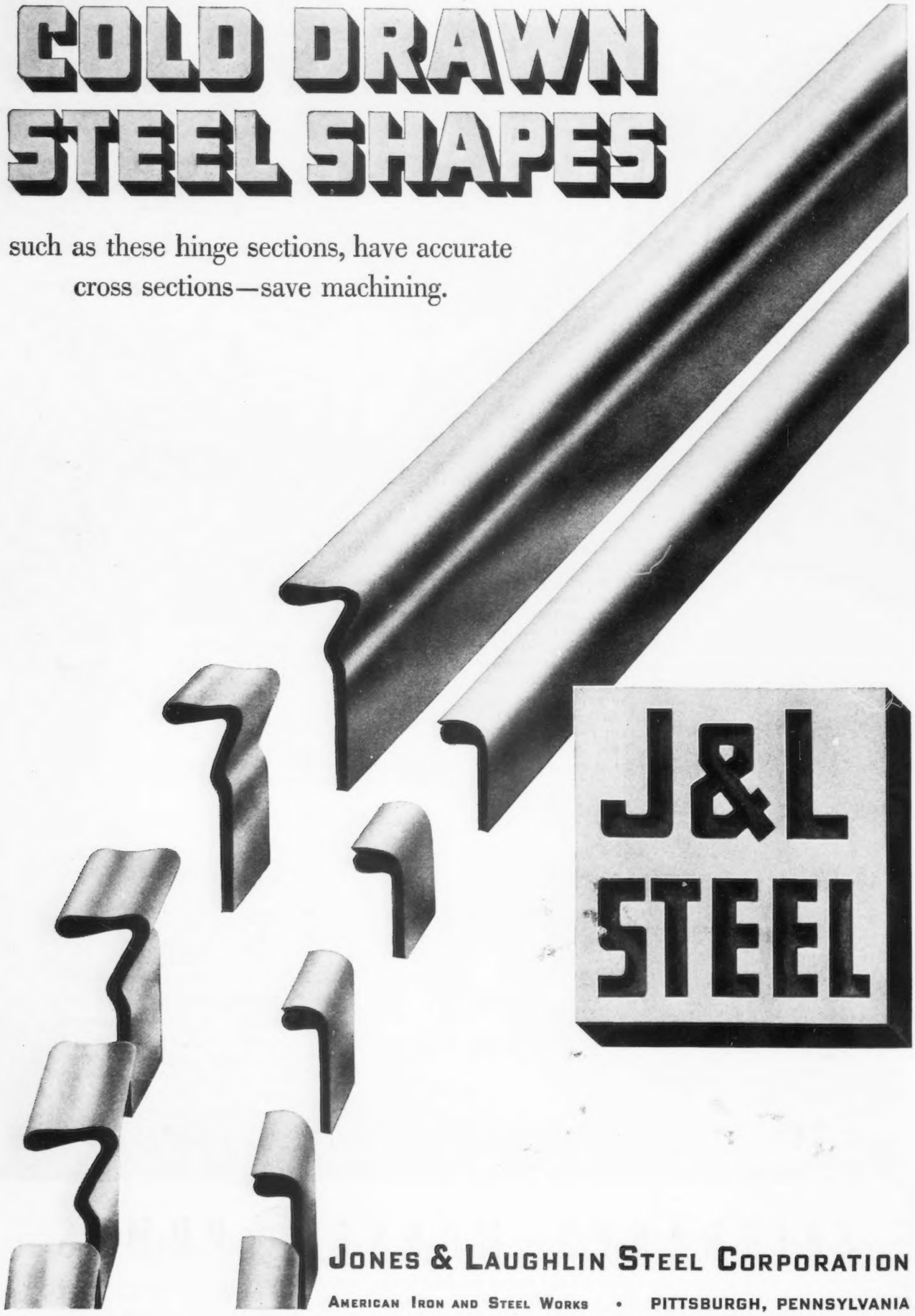
MOTORS FAIRBANKS SCALES WATER SYSTEMS FARM EQUIPMENT AIR CONDITIONERS

COLD DRAWN STEEL SHAPES

such as these hinge sections, have accurate cross sections—save machining.



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JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS • PITTSBURGH, PENNSYLVANIA

This 750-ton *universal* type Birdsboro Press is doing a mighty job in National Defense. With it, *all* pressed, sheared, formed and deep drawn parts for one and two-seat attack, pursuit, small bombing and training planes are being formed—at high speed —under perfect control.

It offers 3 types of operations; rubber pad, die cushion, bending brake — 3 types of control; fast manual, full automatic, supersensitive micro-manual.

Truly a Master Tool of modern industry, designed and built at Birdsboro to meet a national need.

SPECIFICATIONS

Bed Area—120" R. L. by 50" F. B.
Adjustable Daylight—60" max.
Adjustable Stroke—48" max.
Depth of Draw—22" max.
Closing Speed—20" to 240" per min.
Pressing Speed—11" per min. max.
Opening Speed—240" per min.
Main and Die Cushion pressures adjustable by stepless increments through unusually wide range.

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HYDRAULIC PRESSES ROLLS
MILL EQUIPMENT
SPECIAL MACHINERY
CRUSHING MACHINERY

BIRDSBORO
Hydraulic Presses

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Abrasive Cloth & Paper
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

Abrasives—Polishing
Abrasive Co., Philadelphia, Pa.
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
General Abrasive Co., Inc., Niagara Falls, New York.
Norton Co., Worcester, Mass.
Siefen, J. J. Co., Detroit, Mich.

Abrasives—Steel Shot and Grit
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Harrison Abrasive Corp., Manchester, N. H.
Pangborn Corporation, Hagerstown, Md.
Pittsburgh (Pa.) Crushed Steel Co.
Steel Shot & Grit Co., Boston, Mass.

Accumulators
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Morgan Engineering Co., The, Alliance, Ohio.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.
Wood, R. D., & Co., Philadelphia, Pa.

Acetylene
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

Acids—Pickling
American Chemical Paint Co., Ambler, Pa.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

Alloys—Bismuth
Cerro De Pasco Copper Corp., 44 Wall St., New York City.

Alloys—Copper
American Brass Co., The, Waterbury, Conn.
Ampco Metal, Inc., Milwaukee, Wis.
Mallory, P. R., & Co., Inc., Indianapolis, Ind.
Revere Copper & Brass, Inc., 230 Park Ave., N. Y. C.

Alloys—Corrosion & Abrasion Resistant
Coast Metals, Inc., Canton, Ohio.
Wall-Colmonoy Corp., Detroit, Mich.

Alloys—See Ferroalloys

Alloys—Low Melting Matrix
Cerro De Pasco Copper Corp., 44 Wall St., New York City.

Alloys—Magnesium
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

Alloys—Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Ampco Metal, Inc., Milwaukee, Wis.
Phosphor Bronze Smelting Co., The, Philadelphia, Pa.

Aluminum
Aluminum Co. of America, Pittsburgh.

Angles, Beams, Channels and Tees
Bethlehem (Pa.) Steel Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Concord Steel Corp., 19 Rector St., N. Y. C.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.
Holliday, W. J., & Co., Hammond, Ind.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Tennessee Coal, Iron & Railroad Co., (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.

Annealing Boxes
Lebanon (Pa.) Steel Foundry.
United Engineering & Fdry. Co., Ptgh.

Arbors
Cincinnati (Ohio) Milling Mch. Co., The.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

Asbestos
Carey, Philip, Co., The, Cincinnati, Ohio.
Johns-Manville Corp., 22 East 40th St., N. Y. C

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Bunting Brass & Bronze Co., The, Toledo, Ohio.
Cadman, A. W., Mfg. Co., Pittsburgh.
Cramp Brass & Iron Foundries Div. of The Baldwin Locomotive Wks., Philadelphia.
National Bearing Metals Corp., Pittsburgh, Pa.
National Lead Co., 111 Bdway., N.Y.C.
Ryerson, Jos. T., & Son, Inc., Chicago, Ill.

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Gisholt Machine Co., Madison, Wis.
Sundstrand Machine Tool Co., Rockford, Ill.

Baling Presses
Baldwin-Southwark Div., Baldwin Locomotive Wks., Phila., Pa.
McKay Machine Co., The, Youngstown, Ohio.

Balls—Burnishing
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
Hartford (Conn.) Steel Ball Co., The.

Balls—Steel
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
Fafnir Bearing Co., The, New Britain, Conn.
Hartford (Conn.) Steel Ball Co., The.
McIntyre Machine Works, Hartford, Conn.
New Departure Div., General Motors Sales Corp., Bristol, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Strom Steel Ball Co., Cicero, Ill.

Barrels—Burnishing & Tumbling
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
Baird Mch. Co., The, Bridgeport, Conn.
Hartford (Conn.) Steel Ball Co., The.
Whiting Corp., Harvey, Ill.

Bars—Aluminum
Aluminum Co. of America, Pittsburgh.

Bars—Brass, Bronze or Copper
American Brass Co., The, Waterbury, Conn.
Bunting Brass & Bronze Co., Toledo, Ohio.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., N. Y. C.

Bars—Cold Drawn
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Crucible Steel Co. of America, Chrysler Bldg., New York City.
Holliday, W. J., & Co., Hammond, Ind.
Jones & Laughlin Steel Corp., Pittsburgh.
Kidd Drawn Steel Co., Aliquippa, Pa.
Monarch Steel Co., Indianapolis, Ind.
Rathbone, A. B. & J., Palmer, Mass.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh, Pa.

Bars—Concrete, Reinforcing
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Corp., Pittsburgh.
Laclede Steel Co., St. Louis, Mo.
Nicetown Plate Washer Co., Inc., Philadelphia.
Republic Steel Corp., Cleveland, Ohio.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Wickwire Brothers, Inc., Cortland, New York.

Bars—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

Bars—Steel
Andrews Steel Co., The, Newport, Ky.
Beals-McCarthy & Rogers, Inc., Buffalo New York.
Bethlehem (Pa.) Steel Company.
Brown-Wales Co., Boston, Mass.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Concord Steel Corp., 19 Rector St., N. Y. C.
Copperweld Steel Co., Warren, Ohio.
Crucible Steel Co. of America, Chrysler Bldg., New York City.
Great Lakes Steel Corp., Ecorse, Detroit.
Holliday, W. J., & Co., Hammond, Ind.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Midvale Co., The, Nicetown, Phila., Pa.
Monarch Steel Co., Indianapolis, Ind.
Potts, Horace T., Co., Philadelphia, Pa.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Youngstown (Ohio) Sheet & Tube Co., The.

Batteries—Storage
Edison Storage Battery Div. of Thomas A. Edison, Inc., West Orange, N. J.
Electric Storage Battery Co., The, Phila.
Philco, Battery Div., Phila., Pa.

Battery Chargers
Cutler-Hammer, Inc., Milwaukee.

Beams—See Angles

Bearings—Babbitt
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Cadman, A. W., Mfg. Co., Pittsburgh.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.

Bearings—Ball
Bantam Bearings Corp., The, South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Fafnir Bearing Co., The, New Britain, Conn.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
McIntyre Machine Works, Hartford, Conn.
New Departure Div., General Motors Sales Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., Poughkeepsie, N. Y.
Torrington (Conn.) Company.

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Ampco Metal, Inc., Milwaukee, Wis.
Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.
National Bearing Metals Corp., Pittsburgh.
Shenango-Penn Mold Co., Dover, Ohio.

Bearings—Needle
Bantam Bearings Corp., The, South Bend, Ind.
Torrington (Conn.) Company.

Bearings—Oilless
Bunting Brass & Bronze Co., Toledo, O.
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.
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Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

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Bantam Bearings Corp., The, South Bend, Ind.
Bower Roller Bearing Co., Detroit, Mich.
Hyatt Bearings Div., General Motors Sales Corp., Harrison, N. J.
Link-Belt Co., 519 North Holmes Ave., Indianapolis, Ind.
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SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

Bearings—Roller Tapered
Bantam Bearings Corp., The, South Bend, Ind.
Bower Roller Bearing Co., Detroit, Mich.
Timken Roller Bearing Co., The, Canton, O.

Bearings—Rolling Mill Equipment
Bantam Bearings Corp., The, South Bend, Ind.
Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
Norma-Hoffman Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

Bearings—Shaft Hanger
Dodge Mfg. Corp., Mishawaka, Ind.
Fafnir Bearing Co., The, New Britain, Conn.
Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Triangle Mfg. Co., Oshkosh, Wis.

Bearings—Thrust
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In Canada: Carbide Tool & Die Company, Ltd., Hamilton, Ont.

THE SUPERIOR TANTALUM-TUNGSTEN CARBIDE TOOLS

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Belt—Conveyor, Elevator
Hewitt Rubber Corp., Buffalo, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

Belting—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
Houghton, E. F., & Co., Philadelphia, Pa.

Belting—Metal, Conveyor, High and Low Temperature
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

Belting—Rubber
Hewitt Rubber Corp., Buffalo, N. Y.
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Belts—V-Type
AllisChalmers Mfg. Co., Milwaukee.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

Bench Legs—Steel
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Benches—Steel Work
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Cleveland Crane & Engineering Co., The, Steelweld Mchry. Div., 1115 East 283rd St., Wickliffe, Ohio.
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American Brass Co., The, Waterbury, Conn.
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Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Company.
Copperweld Steel Co., Warren, Ohio.
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Holliday, W. J., & Co., Hammond, Ind.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Corp., Pittsburgh.
Midvale Co., The, Nicetown, Phila., Pa.
Pittsburgh (Pa.) Steel Co.
Rustless Iron & Steel Corp., Baltimore, Md.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

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Andrews Steel Co., The, Newport, Ky.
Harrisburg (Pa.) Steel Corp.
Pittsburgh (Pa.) Steel Co.
Republic Steel Corp., Cleveland, Ohio.

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Blast Cleaning Equipment
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Hydro-Blast Corp., The, Chicago, Ill.
Pangborn Corporation, Hagerstown, Md.
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Blast Furnace Plants—Complete
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McKee, Arthur G., & Co., Cleveland.

Blast Furnace Specialties
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McKee, Arthur G., & Co., Cleveland.

Blast Gates
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Rockwell, W. S., Co., 50 Church St., N. Y. C.

Blocks—Chain
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North American Mfg. Co., The, Cleveland, Ohio.
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Bolt & Rivet Clippers
Helwig Mfg. Co., St. Paul, Minn.

Bolts—Special
Bethlehem (Pa.) Steel Co.
Cleveland (Ohio) Cap Screw Co., The.
Lamson & Sessions Co., The, Cleveland.
Republic Steel Corp., Cleveland, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

Bolts—Stove
Cleveland (Ohio Cap Screw Co., The.
Lamson & Sessions Co., The, Cleveland.
Progressive Mfg. Co., Torrington, Conn.
Republic Steel Corp., Cleveland, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

Bolts—Stove, Recessed Head
American Screw Co., Providence, R. I.

Bolts—Track
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Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Lamson & Sessions Co., The, Cleveland, Ohio.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

Bolts and Nuts
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Bethlehem (Pa.) Steel Company.
Clark Bros. Bolt Co., Millidale, Conn.
Cleveland (Ohio) Cap Screw Co., The.
Lamson & Sessions Co., The Cleveland.
Republic Steel Corp., Cleveland, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Triplex Screw Co., Cleveland.

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Bullard Co., The, Bridgeport, Conn.
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.
Gairing Tool Co., The, Detroit.
Gisholt Machine Co., Madison, Wisconsin.

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Hill-Clarke Mchry. Co., 647 W. Washington Blvd., Chicago.
Lucas Machine Tool Co., Cleveland.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

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Barnes, W. F. & John, Co., Rockford, Ill.
Bullard Co., The, Bridgeport, Conn.

Boring Machines—Diamond & Carbide Tools
Barnes, W. F. & John, Co., Rockford, Ill.
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.
Heald Machine Co., Worcester, Mass.
Sheffield Corp., The, Gage Div., Dayton, Ohio.

Boring Machines—Jig
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

Boring & Turning Mills—Vertical
Bullard Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Planer Co.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

Boxes—Shop
All-Steel-Equip Co., Inc., 702 John St., Aurora, Ill

Boxes—Stacking
All-Steel-Equip Co., Inc., 702 John St., Aurora, Ill.
Union Metal Mfg. Co., Canton, Ohio.

Brake Lining & Blocks—Asbestos
Johns-Manville Corp., 22 E. 40th St., N. Y. C.
Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Inc., The, 2 Towsend St., Passaic, N. J.

Brakes—Electric
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.

Brakes—Magnetic
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

Brakes—Metal Forming
Birdsboro (Pa.) Steel Foundry & Machine Co.
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Shaper Co., The.
Cleveland Crane & Engineering Co., The, Steelweld Mchry. Div., 1115 East 283rd St., Wickliffe, Ohio.
Dreis & Krump Mfg. Co., Chicago.
Ferracute Machine Co., Bridgeton, New Jersey.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

Brick—Acid-Proof
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

Brick—Insulating
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.
Carborundum Co., The, Perth Amboy, N. J.

Broaches
Colonial Broach Co., Detroit.
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.
National Broach & Machine Co., Detroit, Mich.

Broaching Machines
Bullard Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Milling Mch. Co., The.
Colonial Broach Co., Detroit.
Lucas Machine Tool Co., Cleveland.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.

Bronze—Phosphor
American Brass Co., The, Waterbury, Conn.
Bunting Brass & Bronze Co., Toledo, Ohio.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

Brushes—Industrial
National Carbon Co., Inc., Carbon Sales Div., Cleveland, Ohio.
Osborn Manufacturing Co., The, Cleveland, Ohio.
Pittsburgh Plate Glass Co., Brush Div. Baltimore, Md.

Buckets—Clamshell, Grab, Dragline
Blaw-Knox Div. of Blaw-Knox Co., Blawnox, Pa.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Hayward Co., The, 50 Church St., N. Y. C.
Heyl & Patterson, Inc., Pittsburgh.
Industrial Brownhoist Corp., Bay City, Mich.
Wellman Engineering Co., The, Cleveland.

Buffers—Portable
Black & Decker Mfg. Co., The, Towson, Md.
Rotor Tool Co., The, Cleveland, Ohio.

Buildings & Bridges—Steel
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
American Rolling Mill Co., The, Middletown, Ohio.
Belmont Iron Works, Philadelphia.
Blaw-Knox Div. of Blaw-Knox Co., Blawnox, Pa.
Iron & Steel Products, Inc., Chicago.

Bulldozers
Ajax Mfg. Co., The, Cleveland, Ohio.
Cleveland Crane & Engineering Co., The Steelweld Mchry. Div., 1115 East 283rd St., Wickliffe, Ohio.

Burners—Oil or Gas
Babcock & Wilcox Co., The, 85 Liberty St., New York City.
North American Mfg. Co., The, Cleveland, Ohio.
Stewart Furnace Div. Chicago Flexible Shaft Co., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, Ohio.
Wean Engineering Co., Inc., The, Warren, Ohio.
Wilson Lee Sales Corp., Cleveland, Ohio.

Burnishing Machines—Gear
Sheffield Corp., The, Gage Div., Dayton, Ohio.

Burring Machines
National Broach & Machine Co., Detroit, Mich.
Sheffield Corp., The, Gage Div., Dayton, Ohio.

Bushings—Bronze
Ampco Metal, Inc., Milwaukee, Wis.
Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.
Shenango-Penn Mold Co., Dover, Ohio.

Bushings—Drill Jig
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

Bushings—Oilless
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

By-Product Plants
Koppers Co., Engineering & Construction Div., Pittsburgh.

Cabinets—Filing
All-Steel-Equip Co., Inc., 702 John St., Aurora, Ill.

Cabinets—Wardrobe
All-Steel-Equip Co., Inc., 702 John St., Aurora, Ill.

Cable—Electric
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland, Ohio.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., The, Cleveland.
Roebling's, John A., Sons Co., Trenton, N. J.

Calcium Metal & Alloys
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C

Cams
Hartford (Conn.) Special Machinery Co., The.

Carbide
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

Carbon—Brick & Powder
National Carbon Co., The, Carbon Sales Div., Cleveland, Ohio.

Carloaders
Clark Tructractor Div. Clark Equipment Co., Battle Creek, Mich.

Cars—Dump
Pressed Steel Car Co., Inc., Koppel Div., Pittsburgh, Pa.

Cars—Industrial and Mining
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Heyl & Patterson, Inc., Pittsburgh.
Pressed Steel Car Co., Inc., Koppel Div., Pittsburgh, Pa.

Cars—Ladle, Cinder & Slag
Pressed Steel Car Co., Inc., Koppel Div., Pittsburgh, Pa.

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Budd, Edward G., Mfg. Co., Philadelphia, Pa.

Cars—Railway
Iron & Steel Products, Inc., Chicago.

Casters
Darnell Corp., Ltd., Long Beach, Calif.

Castings—Acid or Heat Resisting
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Ampco Metal, Inc., Milwaukee, Wis.
Coast Metals, Inc., Canton, Ohio.
Cramp Brass & Iron Foundries Div. of The Baldwin Locomotive Wks., Philadelphia.
Duriron Co., Inc., 438 N. Findlay St., Dayton, Ohio.
Hoskins Mfg. Co., Detroit, Mich.
Jewell Alloy & Malleable Co., Inc., 175 Hertel Ave., Buffalo, N. Y.
Lebanon (Pa.) Steel Foundry.

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Meehanite Research Institute, Pittsburgh, Pa.
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Ohio Steel Foundry Co., Lima, Ohio.
Wall-Colmonoy Corp., Detroit, Mich.
Wheeling (W. Va.) Bronze Casting Co.

Castings—Alloy Steel
Advance Foundry Co., The, Dayton, Ohio.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Hartford (Conn.) Electric Steel Corp.
Lebanon (Pa.) Steel Foundry.
Mackintosh-Hemphill Co., Pittsburgh.
Michiana Products Corp., Michigan City, Ind.
National-Erie Corp., Erie, Pa.
Taylor-Wharton Iron & Steel Co., High Bridge, New Jersey.
Unitcast Corp., Toledo, Ohio.

Castings—Brass, Bronze, Copper or Aluminum
Aluminum Co. of America, Pittsburgh.
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Cadman, A. W., Mfg. Co., Pittsburgh.
Cramp Brass & Iron Foundries Div. of The Baldwin Locomotive Wks., Philadelphia.
Koppers Co., Bartlett Hayward Div., Baltimore, Md.
National Bearing Metals Corp., Pittsburgh.
Shenango-Penn Mold Co., Dover, Ohio.
Spencer's, I. S., Sons, Inc., Guilford, Ct.
Wheeling (W. Va.) Bronze Casting Co.

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Aluminum Co. of America, Pittsburgh.

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Lebanon (Pa.) Steel Foundry.
National-Erie Corp., Erie, Pa.
Ohio Steel Foundry Co., Lima, Ohio.
Unitcast Corp., Toledo, Ohio.

Castings—Gray Iron and Semi-Steel
Advance Foundry Co., The, Dayton, Ohio.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Engineering Co., Philadelphia.
Brown & Brown, Inc., Lima, Ohio.
Cox & Sons Co., The, Bridgeton, N. J.
Cramp Brass & Iron Foundries Div. of The Baldwin Locomotive Wks., Philadelphia.
Etna Machine Co., The, Toledo, Ohio.
Gillette-Vibber Co., The, New London, Conn.
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North Wales (Pa.) Mach Co., Inc.
Ramsey Chain Co., Inc., Albany, N. Y.
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West Point (Ga.) Foundry & Machine Co.

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Michiana Products Corp., Michigan City, Ind.

Castings—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

Castings—Malleable
Jewell Alloy & Malleable Co., Inc., 175 Hertel Ave., Buffalo, N. Y.
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Peoria (Ill.) Malleable Castings Co.

Castings—Manganese Steel
Taylor-Wharton Iron & Steel Co., High Bridge, New Jersey.

Castings—Meehanite Metal
Meehanite Research Institute, Pittsburgh, Pa.

Castings—Monel & Nickel
Cramp Brass & Iron Foundries Div. of The Baldwin Locomotive Wks., Philadelphia.

Castings—Phosphor Bronze
Phosphor Bronze Smelting Co., The, Philadelphia, Pa.

Castings—Steel
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, Ohio.
Bethlehem (Pa.) Steel Company.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Continental Roll & Steel Foundry Co., East Chicago, Ind.
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Mesta Mch. Co., Pittsburgh.
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National-Erie Corp., Erie, Pa.
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Coast Metals, Inc., Canton, Ohio.
Meehanite Research Institute, Pittsburgh, Pa.
Taylor-Wharton Iron & Steel Co., High Bridge, New Jersey.
Wall-Colmonoy Corp., Detroit, Mich.

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Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

Cement—Refractory
Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Carborundum Co., The, Perth Amboy, N. J.
Johns-Manville Corp., 22 East 40th St., New York City.

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Hendey Machine Co., Torrington, Conn.
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Heyl & Patterson, Inc., Pittsburgh.
Link-Belt Co., 220 So. Belmont Ave., Indianapolis, Ind.

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Link-Belt Co., 220 So. Belmont Ave., Indianapolis, Ind.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Whitney Chain & Mfg. Co., Hartford, Ct.

Chains—Welded
American Chain & Cable Co., Inc., York, Pa.

Chairs—Steel, Office
Artility Metal Products, Inc., Elkhart, Ind.
Harter Corp., Sturgis, Mich.

Chamfering Machines (Gear)
Cross Gear & Machine Co., Detroit, Mich.
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Cunningham, M. E., Co., Pittsburgh, Pa.
Noble & Westbrook Mfg. Co., The, E. Hartford, Conn.

Chemicals—Industrial
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

Chisels
Cleveland (Ohio) Punch & Shear Works Co., The.
Cleveland Steel Tool Co., The, 660 East 82nd St., Cleveland, Ohio.

Chromium Metal & Alloys
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

Chucking Machines
Baird Mch. Co., The, Bridgeport, Conn.
Cleveland (Ohio) Automatic Machine Co., The.
Gisholt Machine Co., Madison, Wis.
Goss & DeLeeuw Machine Co., New Britain, Conn.
Jones & Lamson Machine Co., Springfield, Vt.
National Acme Co., The, Cleveland.
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.
Potter & Johnston Machine Co. Pawtucket, R. I.

To All Americans who have not been Drafted

☆

Tonight, when the sun goes down, it will set not only on homes but also on Army camps, Naval stations and defense outposts.

It will set on one and a half million young men in uniform. Most of them will be far from home. Many of them will be in places remote from towns and cities.

What their life will be like *after* the sun goes down depends largely on you.

These men need clubs . . . places where they can go for recreation and comfort in the evening . . . places where they can rest and relax and enjoy good companionship . . . places where they can have help and advice if they want it.

To provide such service clubs, six of America's most experienced organizations have banded together to form the U. S. O. (comprising the Y. M. C. A.; National Catholic Community Service; Salvation Army; Y. W. C. A.; Jewish Welfare Board; National Travelers Aid Association).

The U. S. O. will set up more than 360 of these clubs. The Government will supply the buildings . . . but to the American public belongs the responsibility of running them and financing them. The cost for the first year is estimated at $10,765,000.

So, to you who have not been drafted, we say . . . here is the chance you have been waiting for to aid in national defense. And if you are getting more than $21 a month yourself, see if you can share some small part of it to make life more pleasant for those who *have* been drafted.

Will you join the army *behind* the Army? Say yes . . . today!

Send your contribution to United Service Organizations, National Headquarters, Empire State Building, New York, N. Y., or to your local U. S. O. Committee.

Your Chance to Serve—Support the U ★ S ★ O

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Chucks—Air Operated
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Tomkins-Johnson Co., The, Jackson, Mich.

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Cushman Chuck Co., Hartford, Conn.
Millers Falls Co., Greenfield, Mass.
Morse Twist Drill & Mach Co., New Bedford, Mass.
North Bros. Mfg. Co., Philadelphia, Pa.

Chucks—Drill, Quick Change
Apex Machine & Tool Co., The, Dayton, Ohio.

Chucks—Lathe
Cushman Chuck Co., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vt.

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American Chemical Paint Co., Ambler, Pa.
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Houghton, E. F., & Co., Philadelphia, Pa.
Oakite Products, Inc., 22 Thames St., New York City.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

Cleaners, Vacuum—Industrial
Spencer Turbine Co., Hartford, Conn.

Cleaning Equipment (Metal)—Electro-Chemical
Bullard-Dunn Div., The Bullard Co., Bridgeport, Conn.

Clutches
Dodge Mfg. Corp., Mishawaka, Ind.
Fairbanks, Morse & Co., Chicago.
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.
Morse Chain Co., Ithaca, N. Y.
Twin Disc Clutch Co., Racine, Wis.

Clutches—Magnetic
Cutler-Hammer, Inc., Milwaukee.
Dings Magnetic Separator Co., 728 Smith St., Milwaukee.
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

Coal
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Koppers Coal Co., The, Pittsburgh.
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Coal, Ore & Ash Handling Machinery
Heyl & Patterson, Inc., Pittsburgh.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.

Cobalt Metal
Central Trading Corp., 511 Fifth Ave., N. Y. C.

Coiling Machinery—Wire Spring
Torrington (Conn.) Mfg. Co., The.

Coke—Metallurgical
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Wieman & Ward Co., The, Pittsburgh, Pa.

Coke Oven Machinery
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Cold Roll Forming Machines
McKay Machine Co., The, Youngstown, Ohio.
Yoder Co., The, Cleveland, Ohio.

Collets
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Hardinge Brothers, Inc., Elmira, New York.

Columbium
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

Combustion Controls
Brown Instrument Co., The, Philadelphia, Pa.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Morgan Construction Co., Worcester, Mass.
North American Mfg. Co., The, Cleveland, Ohio.

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Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Houghton, E. F., & Co., Philadelphia, Pa.
Oakite Products, Inc., 22 Thames St., N. Y. C.
Penola, Inc., Pittsburgh, Pa.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Standard Oil Co. (Indiana), Chicago.
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Compressors—Air
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago.
Spencer Turbine Co., Hartford, Conn.
Worthington Pump & Machinery Corp., Harrison, New Jersey.

Compressors—Gas
Worthington Pump & Machinery Corp., Harrison, New Jersey.

Condensers—Surface & Jet
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Worthington Pump & Machinery Corp., Harrison, New Jersey.

Controllers—Electric
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
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Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.
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Conveying and Elevating Machinery
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Link-Belt Co., 300 West Pershing Road, Chicago, Ill.
Logan Co., Inc., Louisville, Ky.
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Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.

Conveyors—Gravity
Logan Co., Inc., Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.

Conveyors—Monorail
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., 1115 East 283rd St., Wickliffe, Ohio.

Coolers—For Cutting Oils
Harrison Radiator Div. General Motors Corp., Lockport, N. Y

Core Oil
Houghton, E. F., & Co., Philadelphia, Pa.
Penola, Inc., Pittsburgh, Pa.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., Philadelphia.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

Cotter Pins
American Chain & Cable Co., Inc., York, Pa.
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 329 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, Cleveland.
Western Wire Prods. Co., St. Louis, Mo.

Counterbores
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.
Cleveland (Ohio) Twist Drill Co., The.
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.
Gairing Tool Co., Detroit.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

Counting Devices
Veeder-Root, Inc., Hartford, Conn.

Couplings—Flexible & Shaft
Ajax Flexible Coupling Co., Westfield, N. Y.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Hoppers Co., Bartlett Hayward Div., Baltimore, Md.
Lovejoy Flexible Coupling Co., 4979 Lake St., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Poole Foundry & Mch. Co., Baltimore, Md.
Twin Disc Clutch Co., Racine, Wis.

Couplings—Pipe
Champion Machine & Forging Co., The, Cleveland, Ohio.
Harrisburg (Pa.) Steel Corp.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

Cranes—Crawling
American Hoist & Derrick Co., St. Paul, Minn.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., The, Bucyrus, Ohio.

Cranes—Electric Traveling
Armel, James P., Pittsburgh.
Cleveland Crane & Engineering Co., 1115 East 283rd St., Wickliffe, Ohio.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., 1115 East 283rd St., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Northern Engineering Works, Detroit, Mich
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, O.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

Cranes—Gantry
Cleveland Crane & Engineering Co., 1115 East 283rd St., Wickliffe, Ohio.
Dravo Corp., Engineering Wks. Div., Pittsburgh.
Euclid Crane & Hoist Co., The, Euclid, Ohio.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Morgan Engineering Co., The, Alliance, O.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

Cranes—Hand
American Monorail Co., The, Cleveland.
Cleveland Crane & Engineering Co., 1115 East 283rd St., Wickliffe, Ohio.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., 1115 East 283rd St., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
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Northern Engineering Works, Detroit.
Reading (Pa.) Chain & Block Corp.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
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American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., 1115 East 283rd St., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Whiting Corp., Harvey, Ill.

Cranes—Locomotive
American Hoist & Derrick Co., St. Paul, Minn.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., The, Bucyrus, O.

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Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., 1115 East 283rd St., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Northern Engineering Works, Detroit.
Reading (Pa.) Chain & Block Corp.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

Cranes—Portable
Canton Foundry & Mach. Co., The, Div. of The Hill Acme Co., 6100 Breakwater Ave., Cleveland, Ohio.

Crankshafts
Bay City Forge Co., Erie, Pa.
Midvale Co., The, Nicetown, Phila., Pa.
Transue & Williams Steel Forging Corp., Alliance, Ohio.

Crushers
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.

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Chicago (Ill.) Wheel & Mfg. Co., 1101 W. Monroe St.

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Davis Keyseater Co., 400 Exchange St., Rochester, N. Y

Cutters—Milling
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Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.
Cleveland (Ohio) Twist Drill Co., The.
Gairing Tool Co., The, Detroit.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Victor Machinery Exchange, 251 Centre St., N. Y. C.

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Hanniffin Mfg. Co., Chicago, Ill.
Logansport (Ind.) Machine, Inc.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee, Wis.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
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Midvale Co., The, Nicetown, Phila., Pa.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
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Reed-Prentice Corp., Worcester, Mass.

Die—Hard Carbide Inserts
McKenna Metals Co., Latrobe, Pa.

Die Sinking Machines
Cincinnati (Ohio) Milling Mch. Co., The.
Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn.

Dies—Cast Tool Steel
Advance Foundry Co., The, Dayton, Ohio.

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Dies—Pipe Threading
Greenfield (Mass.) Tap & Die Corp.
Landis Mch. Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., The, Cleveland.

Dies—Resistance Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

Dies—Sheet Metal Working
Budd, Edward G., Mfg. Co., Philadelphia, Pa.
Niagara Machine & Tool Works, Buffalo, New York.
Sheffield Corp., The, Gage Div., Dayton, Ohio.
South Bend (Ind.) Tool & Die Co., 2406 So. Main St.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.

Dies—Steel Marking
Cunningham, M. E., Co., Pittsburgh, Pa.
Noble & Westbrook Mfg. Co., The, E. Hartford, Conn.

Dies—Threading
Eastern Mach. Screw Corp., New Haven, Ct.
Geometric Tool Co., The, New Haven, Conn.
Greenfield (Mass.) Tap & Die Corp.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., The, Cleveland.

Dies—Threading, Opening
Eastern Mach. Screw Corp., New Haven, Ct.
Geometric Tool Co., The, New Haven, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., The, Cleveland, Ohio.

Dies—Wire Drawing
Carboloy Co., Inc., 11153 E. 8-Mile Road, Detroit, Michigan.
Vascoloy-Ramet Corp., North Chicago, Ill.

Doors & Shutters—Steel
Kinnear Mfg. Co., Columbus, Ohio.
Mahon, R. C., Co., Detroit, Mich.

Drafting Room Furniture
Pease, C. F., Company, The, 2695 W. Irving Pk. Road, Chicago, Ill.

Dressers—Grinding Wheel
Carboloy Co., Inc., 11159 E. 8-Mile Rd., Detroit, Mich.

Drilling Machines—Bench
Leland-Gifford Co., Worcester, Mass.

Drilling Machines—Continuous
Davis & Thompson Co., Milwaukee, Wis.

Drilling Machines—Multiple Spindle
Barnes, W. F. & John, Co., Rockford-Ill.
Henry & Wright Mfg. Co., The, Hartford, Conn.

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Black & Decker Mfg. Co., The, Towson, Md.
Millers Falls Co., Greenfield, Mass.
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Helwig Mfg. Co., St. Paul, Minn.
Rotor Tool Co., The, Cleveland, Ohio.
Warner & Swasey Co., The, Cleveland.

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Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Bickford Tool Co., The.
Cleveland (Ohio) Punch & Shear Works, Co., The.

Drilling Machines—Sensitive
Buffalo (N. Y.) Forge Co., 402 Broadway.
Leland-Gifford Co., Worcester, Mass.

Drilling Machines—Vertical
Barnes, W. F. & John, Co., Rockford, Ill.
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Bickford Tool Co., The.
Cleereman Mch. Tool Co., Green Bay, Wis.

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Cleveland (Ohio) Punch & Shear Works Co.
Lynd-Farquhar Co., Boston, Mass.

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North Bros. Mfg. Co., Philadelphia, Pa.

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Medart Co., The, St. Louis, Mo.

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Abrasive Machine Tool Co., East Providence, R. I.
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Mahon, R. C., Co., Detroit, Mich.
Pangborn Corporation, Hagerstown, Md.
Ruemelin Mfg. Co., 3870 N. Palmer St., Milwaukee, Wisconsin.
Torit Mfg. Co., 287 Walnut St., St. Paul, Minn.
Whiting Corp., Harvey, Ill.

Economizers
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

Electrical Equipment
Allis-Chalmers Mfg. Co., Milwaukee.
Electric Controller & Mfg. Co., Cleveland, Ohio.
Fairbanks, Morse & Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Ptgh., Pa.

Electrodes—Welding
Arcos Corp., Philadelphia, Pa.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Lincoln Electric Co., The, Cleveland.
Mallory, P. R., & Co., Inc., Indianapolis, Ind.
Maurath, Inc., 7400 Union Ave., Cleveland.
Una Welding, Inc., Cleveland, Ohio.

Electroplating Equipment & Supplies
Meaker Co., The, Chicago, Ill.
Siefen, J. J., Co., Detroit, Mich.
United Chromium Incorporated, 51 East 42nd St., N. Y. C.

Engineers & Contractors
Brassert, H. A., & Co., Pittsburgh.
Koppers Co., Engineering & Construction Div., Pittsburgh, Pa.
McKee, Arthur G., & Co., Cleveland, Ohio.

Engineers—Consulting and Industrial
Koppers Co., Engineering & Construction Div., Pittsburgh.

Engines—Diesel
Worthington Pump & Machinery Corp., Harrison, New Jersey.

Engines—Gas, Oil
Fairbanks, Morse & Co., Chicago, Ill.
Worthington Pump & Machinery Corp., Harrison, New Jersey.

Facing Machines—Precision
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

Factory & Plant Sites
Zoll, Edward H., 207 Market St., Newark, N. J.

Fans—Ventilating
Buffalo (N. Y.) Forge Co., 492 Broadway.

Felt—Wool Mechanical
American Felt Co., Glenville, Conn.

Fence—Chain Link
American Steel & Wire (U. S. Steel Corp. Subsidiary), Cleveland.
Atlas Fence Co., Philadelphia, Pa.
Buffalo (N. Y.) Wire Works Co., Inc.
Page Steel & Wire Div. American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh (Pa.) Steel Co.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

Fencing—Wire
Jones & Laughlin Steel Corp., Pittsburgh.

Ferroalloys
Climax Molybdenum Co., 500 Fifth Ave., N. Y. C.
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Titanium Alloy Mfg. Co., The, Niagara Falls, New York.

Ferrochrome
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
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Ferromanganese
Bethlehem (Pa.) Steel Company.
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Jones & Laughlin Steel Corp., Pittsburgh.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank, & Co., Inc., Philadelphia.

Ferromolybdenum
Climax Molybdenum Co., 500 Fifth Ave., N. Y. C.

Ferrosilico Manganese
Ohio Ferro-Alloys Corp., Canton, Ohio.

Ferrosilicon
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
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Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank, & Co., Inc., Philadelphia.

Ferrotitanium
Titanium Alloy Mfg. Co., The, Niagara Falls, New York.

Ferrovanadium
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

Fibre—Sheets, Tubes, Rods, Fabricated Parts
Continental-Diamond Fibre Co., Newark, Delaware.

Files & Rasps
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Nicholson File Co., Providence, R. I.

Filing Machines
Continental Machines, Inc., 1311 S. Washington Ave., Minneapolis, Minn.

Filter Cloth—Asbestos
Johns-Manville Corp., 22 East 40th St., New York City.

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Whiting Corp., Harvey, Ill.

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King Fifth Wheel Co., 2915 N. Second St., Philadelphia.

Flexible Shaft Equipment
Lovejoy Flexible Coupling Co., 4979 Lake St., Chicago, Ill.
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Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

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Carey, Philip Co., The, Cincinnati, O.
Johns-Manville Corp., 22 East 40th St., New York City

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Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
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Fluorspar
Hillside Fluor Spar Mines, 38 S. Dearborn St., Chicago, Ill.

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Linde Air Products Company, The, 30 East 42nd St., N. Y. C.
Ruby Chemical Co., Columbus, Ohio.

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Ajax Mfg. Co., The, Cleveland, Ohio.

Forging Machines
Ajax Mfg. Co., The, Cleveland, Ohio.

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Commonwealth Brass Corp., Detroit.
Cramp Brass & Iron Foundries Div. of The Baldwin Locomotive Wks., Philadelphia.
Harvey Metal Corp., The, Chicago, Ill.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Transue & Williams Steel Forging Corp., Alliance, Ohio.

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Atlas Drop Forge Co., Lansing, Mich.
Canton (Ohio) Drop Forging & Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Champion Machine & Forging Co., The, Cleveland, Ohio.
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Wilcox, D., Mfg. Co., Mechanicsburg, Pa.
Williams, J. H., & Co., Buffalo, N. Y.

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American Hollow Boring Co., 1912 Raspberry St., Erie, Pa.
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National Forge & Ordnance Co., Irvine, Pa.

Forgings—Iron & Steel
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National Forge & Ordnance Co., Irvine, Pa.
Standard Steel Wks. Div. The Baldwin Locomotive Works, Phila., Pa.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

Forgings—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

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Bethlehem (Pa.) Steel Company.
Lamson & Sessions Co., The, Cleveland.
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Hardinge Brothers, Inc., Elmira, New York.

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Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

Furnace Atmosphere Controls
Wilson Lee Sales Corp., Cleveland, Ohio.

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Amsler-Morton Co., The, Pittsburgh, Pa.
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Surface Combustion Corp., 2375 Dorr St., Toledo, Ohio.
Wean Engineering Co., Inc., Warren, Ohio.
Wilson Lee Sales Corp., Cleveland, Ohio.

Furnaces—Electric, Steel Melting
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Detroit Electric Furnace Div. Kuhlman Electric Co., Bay City, Mich.
Pittsburgh (Pa.) Lectromelt Furnace Corp.

Furnaces—Forging
Drever Co., The, Philadelphia, Pa.
Holcroft & Co., Detroit.
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Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.
Surface Combustion Corp., 2375 Dorr St., Toledo, Ohio.
Wean Engineering Co., Inc., Warren, Ohio.
Wilson Lee Sales Corp., Cleveland, Ohio.

Furnaces—Galvanizing
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Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago, Flexible Shaft Co., Chicago.
Surface Combustion Corp., 2375 Dorr St., Toledo, Ohio.
Wilson Lee Sales Corp., Cleveland, Ohio.

Furnaces—Heat Treating, Electric
Despatch Oven Co., Minneapolis, Minn.
General Electric Co., Schenectady, N.Y.
Holcroft & Co., Detroit.
Hoskins Mfg. Co., Detroit, Mich.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.
R-S Products Corp., Philadelphia, Pa.
Rockwell, W. S., Co., 50 Church St., N. Y. C.
Salem (Ohio) Engineering Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Furnaces—Heat Treating, Oil or Gas
Despatch Oven Co., Minneapolis, Minn.
Drever Co., The, Philadelphia, Pa.
Holcroft & Co., Detroit.
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.
Lithium Corp., The, Newark, New Jersey.
Pennsylvania Industrial Engineers, Pittsburgh.
R-S Products Corp., Philadelphia, Pa.
Salem (Ohio) Engineering Co.
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Wean Engineering Co., Inc., Warren, Ohio.
Wilson Lee Sales Corp., Cleveland, Ohio.

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Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.
Wilson Lee Sales Corp., Cleveland, Ohio.

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Amsler-Morton Co., The, Pittsburgh, Pa.
McKee, Arthur G., & Co., Cleveland, Ohio.

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Surface Combustion Corp., 2375 Dorr St., Toledo, Ohio.

Furnaces—Sheet & Tin Mill
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
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Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

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American Hot Dip Galvanizers Ass'n, Inc., Pittsburgh.
Cattie, Joseph P., & Bros., Phila.
Enterprise Galvanizing Co., Philadelphia.
Southern Galvanizing Co., Baltimore, Md.

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Erie (Pa.) Foundry Co.
Wean Engineering Co., Inc., The, Warren, Ohio.

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Meaker Co., The, Chicago, Ill

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Koppers Co., Engineering & Construction Div., Pittsburgh.
Morgan Construction Co., Worcester, Mass.
Wood, R. D., & Co., Philadelphia, Pa.

Gas Scrubbers
Research Corp., 405 Lexington Ave., New York City.

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Garlock Packing Co., The, Palmyra, N. Y.
Johns-Manville Corp., 22 East 40th St., New York City.

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National Broach & Mch. Co., Detroit, Mich.

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Gleason Works, Rochester, N. Y.

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Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
Mesta Machine Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., Pitgh.

Gear Lapping Machines
Michigan Tool Co., Detroit, Mich.
National Broach & Machin Co., Detroit, Mich.

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Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

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Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
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Generator Sets—Gas & Diesel Engine Plants
Ready-Power Co., The, Detroit, Mich.

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Linde Air Products Company, The, 30 East 42nd St., N. Y. C.
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Kerlow Steel Flooring Co., Jersey City, N. J.

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Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., The, Chicago.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

Grinders—Carbide Tool
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.

Grinders—For Lathe & Planer Tools
Gisholt Machine Co., Madison, Wis.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Sellers, William, & Co., Inc., 1620 Hamilton St., Phila., Pa.
Sundstrand Machine Tool Co., Rockford, Ill.

Grinding and Polishing Machines
Black & Decker Mfg. Co., The, Towson, Md.
Bryant Machinery & Engineering Co., Chicago.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Excelsior Tool & Mch. Co., E. St. Louis, Ill.
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Vonnegut Moulder Corp., Indianapolis, Ind.

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Brown & Sharpe Mfg. Co., Providence, R. I.
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Norton Co., Worcester, Mass.

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Gallmeyer & Livingston Co., Grand Rapids, Mich.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

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Strand, N. A., & Co., Chicago.

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Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

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Rotor Tool Co., The, Cleveland, Ohio.

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Vonnegut Moulder Corp., Indianapolis, Ind.

Grinding Machines—Tap
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Jones & Lamson Machine Co., Springfield, Vt.

Grinding Machines—Thread
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.
Jones & Lamson Machine Co., Springfield, Vt.

Grinding Machines—Universal Cutter
Cincinnati (Ohio) Milling Mch. Co., The.
Continental Machines, Inc., 1311 S. Washington Ave., Minneapolis, Minn.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Landis Tool Co., Waynesboro, Pa.
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Norton Co., Worcester, Mass.

Grinding Wheels
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Bay State Abrasive Products Co., Westboro, Mass.
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Norton Co., Worcester, Mass.

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Chicago (Ill.) Wheel & Mfg. Co., 1101 W. Monroe St.

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Hammers—Helve
Bradley, C. C., & Son, Inc., Syracuse, N. Y.

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Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.
S K F Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Triangle Mfg. Co., Oshkosh, Wis.

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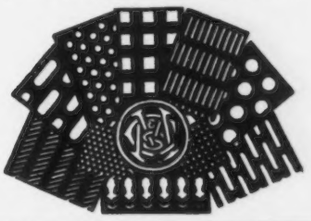

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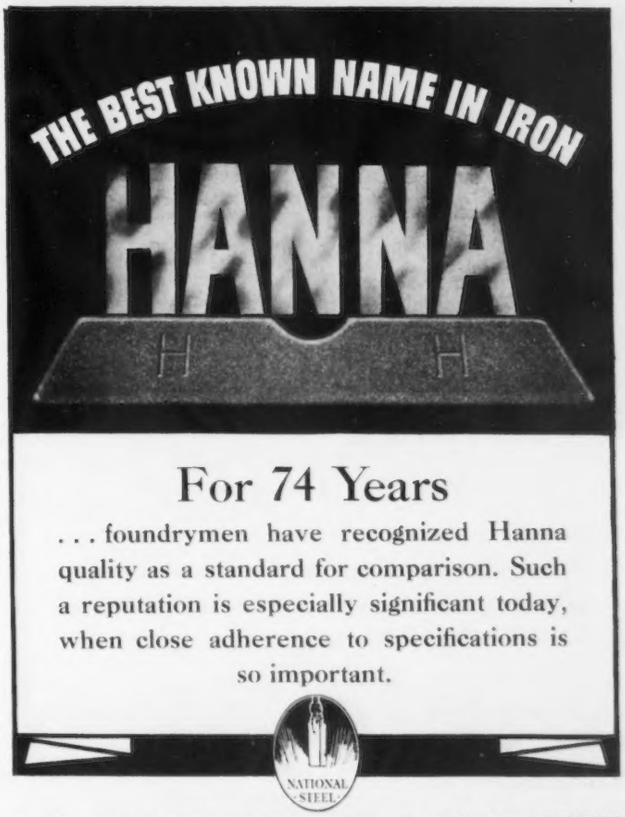

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Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Worth Steel Co., Claymont, Del.
Youngstown (Ohio) Sheet & Tube Co., The.

Plates—Surface
Challenge Machinery Co., Grand Haven, Mich.
South Bend (Ind.) Tool & Die Co., 2406 So. Main St.

Platforms—Skid
Union Metal Mfg. Co., Canton, Ohio.

Plating—Cadmium
Meaker Co., The, Chicago, Ill.

Plating—Chromium
United Chromium Incorporated, 51 East 42nd St., N. Y. C.

Plating—Zinc
Meaker Co., The, Chicago, Ill.

Plugs—Core Hole
Hubbard, M. D., Spring Co., 329 Central Ave., Pontiac, Mich.

Polishing Wheels
Siefen, J. J., Co., Detroit, Mich.

Power Units—Gasoline-Electric, for Industrial Trucks
Ready-Power Co., The, Detroit, Mich.

Power Units—Rotary
Cushman Chuck Co., Hartford, Conn.
New Departure Div., General Motors Sales Corp., Bristol, Conn.

Power Units—Straight Line
Cushman Chuck Co., Hartford, Conn.

Precipitators—Cottrell Electric
Research Corp., 405 Lexington Ave., New York City.

Press Feeds—Automatic
Cleveland (Ohio) Punch & Shear Works Co., The.
Niagara Machine & Tool Works, Buffalo, New York.

Presses—Briquetting — Metal Turnings
Milwaukee (Wis.) Foundry Equipment Co.

Presses—Broaching
Farquhar, A. B., Co., Ltd., York, Pa.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee, Wis.

Presses—Extrusion
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Cleveland (Ohio) Punch & Shear Works Co., The.
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Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.
Wood, R. D., & Co., Philadelphia, Pa.

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Niagara Machine & Tool Works, Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co., The

Presses—Forging
Ajax Mfg. Co., The, Cleveland, Ohio.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Chambersburg (Pa.) Engineering Co.
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Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

Presses—Forming and Bending
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Cincinnati (Ohio) Shaper Co., The.
Cleveland Crane & Engineering Co., The Steelweld Mchry. Div., 1115 East 283rd St., Wickliffe, Ohio.
Cleveland (Ohio) Punch & Shear Works Co., The.
Dreis & Krump Mfg. Co., Chicago.
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Ferracute Machine Co., Bridgeton, New Jersey.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Niagara Mch. & Tool Wks., Buffalo, N. Y.

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Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Zeh & Hahnemann Co., Newark, N. J.

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Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Birdsboro (Pa.) Steel Foundry & Machine Co.
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Denison Engineering Co., 108 W. Chestnut St., Columbus, Ohio.
Farquhar, A. B., Co., Ltd., York, Pa.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Hannifin Mfg. Co., Chicago, Ill.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.
Wood, R. D., & Co., Philadelphia, Pa.

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Baird Mch. Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Shaper Co., The.
Cleveland Crane & Engineering Co., The Steelweld Mchry. Div., 1115 East 283rd St., Wickliffe, Ohio.
Cleveland (Ohio) Punch & Shear Works Co., The.
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L & J Press Corp., Elkhart, Ind.
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Niagara Machine & Tool Wks., Buffalo, N. Y.
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Thomas Mch. Mfg. Co., Pittsburgh.
V & O Press Co., Hudson, N. Y.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.
Zeh & Hahnemann Co., Newark, N. J.

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Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee, Wis.

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Physicists Research Co., Ann Arbor, Mich.

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Jones & Lamson Machine Co., Springfield, Vt.

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Dodge Mfg. Corp., Mishawaka, Ind.
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.

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Dodge Mfg. Corp., Mishawaka, Ind.

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Dings Magnetic Separator Co., 728 Smith St., Milwaukee, Wis.
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

Pulverizers
American Pulverizer Co., 1493 Macklind Ave., St. Louis, Mo.
Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Whiting Corp., Harvey, Ill.

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Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

Pumps—Boiler Feed
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Pumps—Centrifugal
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago.
Logansport (Ind.) Machine, Inc.
Ruthman Machinery Co., Cincinnati Ohio.
Tomkins-Johnson Co., The, Jackson, Mich.
Worthington Pump & Machinery Corp., Harrison, New Jersey.

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Allis-Chalmers Mfg. Co., Milwaukee, Wis.
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Oilgear Co., The, 1311 W. Bruce St., Milwaukee, Wis.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.
Worthington Pump & Machinery Corp., Harrison, New Jersey.

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Roots-Connersville Blower Corp., Connersville, Ind.

Pumps—Vacuum
Worthington Pump & Machinery Corp., Harrison, New Jersey.

Punches
Cleveland (Ohio) Punch & Shear Works Co., The.
Cleveland Steel Tool Co., The, 660 E. 82nd St., Cleveland, Ohio.

Punching and Shearing Machines
Bertsch & Co., Cambridge City, Ind.
Buffalo (N. Y.) Forge Co., 492 Broadway.
Cincinnati (Ohio) Shaper Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.
Excelsior Tool & Mach. Co., E. St. Louis, Ill.
Federal Press Co., Elkhart, Ind.
Niagara Machine & Tool Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Thomas Mch. Mfg. Co., Pittsburgh.

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Brown Instrument Co., The, Philadelphia, Pa.
Hoskins Mfg. Co., Detroit, Mich.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

Rails
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Foster, L. B., Co., Inc., Pittsburgh.
Frank, M. K., 480 Lexington Ave., N. Y. C.
Inland Steel Co., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

Rails—Relaying
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Hyman-Michaels Co., Chicago.
Iron & Steel Products, Inc., Chicago.
Sherwood, E. C., 50 Church St., N. Y. C.

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Greenfield (Mass.) Tap & Die Corp.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Greenfield (Mass.) Tap & Die Corp.

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Hoskins Mfg. Co., Detroit, Mich.
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Norton Co., Worcester, Mass.

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Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

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Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

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Cleveland Steel Tool Co., The, 660 E. 82nd St., Cleveland, Ohio.

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Phosphor Bronze Smelting Co., The, Phila., Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

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Kidd Drawn Steel Co., Aliquippa, Pa.

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American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

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Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

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Continental Roll & Steel Foundry Co., East Chicago, Ind.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
Mackintosh-Hemphill Co., Pittsburgh.
Mesta Mch. Co., Pittsburgh.
National Roll & Fdry. Co., Avonmore, Pa.
Ohio Steel Foundry Co., Lima, Ohio.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh.
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American Chemical Paint Co., Ambler, Pa.
Heatbath Corp., Springfield, Mass.
Houghton, E. F., & Co., Philadelphia, Pa.
Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.

Rust Proofing Process
Alrose Chemical Co., Cranston, Prov., R. I.
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Heatbath Corp., Springfield, Mass.
Mahon, R. C., Co., Detroit, Mich.
Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.
Southern Galvanizing Co., Baltimore, Md.

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Morton Salt Co., Chicago, Ill.

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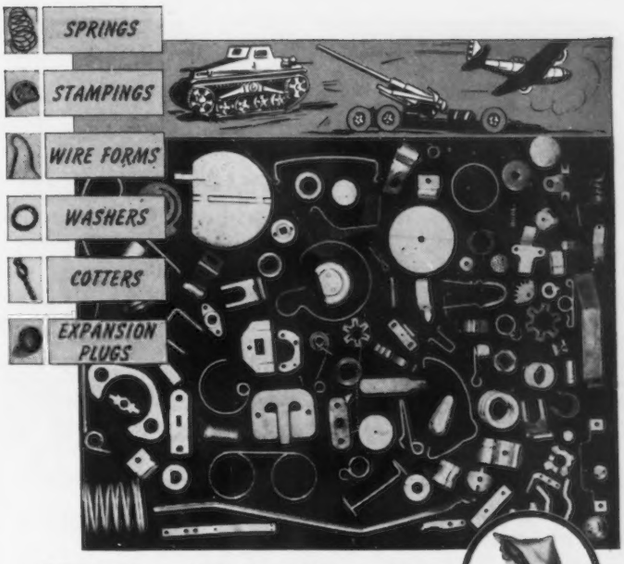
Sand Conditioning Equipment
Hydro-Blast Corp., The, Chicago, Ill.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.



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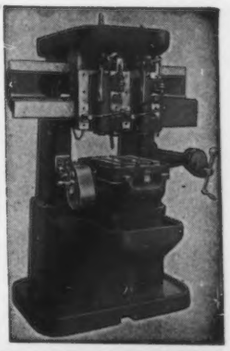

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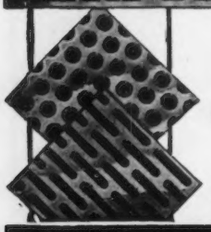

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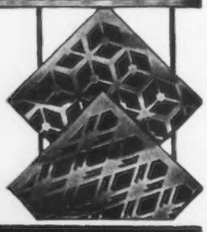

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Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
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Revere Copper & Brass, Inc., 230 Park Ave., New York City.

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American Nickeloid Co., 1312 North Second St., Peru, Ill.

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Jones & Laughlin Steel Corp., Pittsburgh, Pa.
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Dow Chemical Co., The, 331 Jefferson Ave., Midland, Mich.

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Granite City (Ill.) Steel Co.
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago, Ill.
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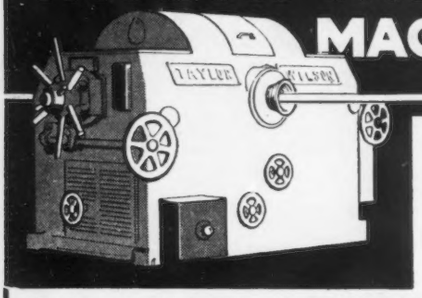

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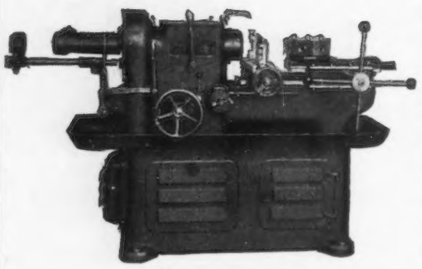

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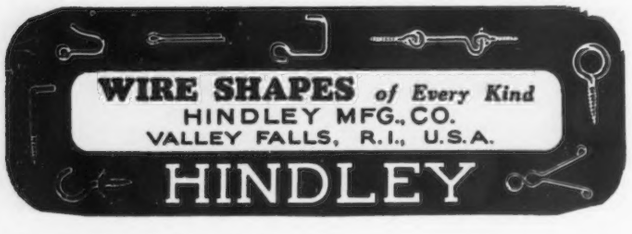

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Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Lobdell Car Wheel Co., Wilmington, Del.
Standard Steel Wks. Div. The Baldwin Locomotive Works, Phila., Pa.

Wheels—Seam Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

Wire—Aluminum
Aluminum Co. of America, Pittsburgh.

Wire—Barb
Republic Steel Corp., Cleveland, Ohio.
Wickwire Brothers, Inc., Cortland, N. Y.

Wire—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Phosphor Bronze Smelting Co., The, Philadelphia, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

Wire—Flat, Round, Square or Special Shapes
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Laclede Steel Co., St. Louis, Mo.
Page Steel & Wire Div. American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh(Pa.) Steel Co.
Rathbone, A. B. & J., Palmer, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

Wire—High Carbon
American Steel & Wire Co. (U. S. Steel Corp., Subsidiary), Cleveland.
Jones & Laughlin Steel Corp., Pittsburgh.
Page Steel & Wire Div. American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Cleveland, Ohio.

Wire—Insulated
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
General Electric Co., Schenectady, N. Y.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.

Wire—Music
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Webb Wire Works, New Brunswick, N. J.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

Wire—Spring
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes, Wallace Co., Div. of Associated Spring Corp., Bristol, Conn.
Columbia Steel So (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.

Wire—Stainless Steel
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Page Steel & Wire Div. American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh (Pa.) Steel Co.
Rustless Iron & Steel Corp., Baltimore, Md.
Webb Wire Works, New Brunswick, N. J.

Wire—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

Wire Cloth
Buffalo (N. Y.) Wire Wks. Co., Inc.
Ludlow-Saylor Wire Co., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

Wire Drawing, Straightening & Cutting Machinery
Ajax Mfg. Co., The, Cleveland.

Wire Forming Machinery
Ajax Mfg. Co., The, Cleveland.
Baird Mch. Co., The, Bridgeport, Conn.
Nilson, A. H., Mach. Co., Bridgeport, Ct.
Torrington (Conn.) Mfg. Co., The.

Wire Forms, Shapes and Specialties
Accurate Spring Mfg. Co., 3819 W. Lake St., Chicago, Ill.
American Spring & Mfg. Corp., Holly, Mich.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes-Gibson-Raymond, Detroit Plant Div. of Associated Spring Corp.
Barnes, Wallace, Co., Div. of Associated Spring Corp., Bristol, Conn.
Buffalo (N. Y.) Wire Wks. Co., Inc.
Cuyahoga Spring Co., The, Cleveland.
Dunbar Bros. Co. Div. of Associated Spring Corp., Bristol, Conn.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 329 Central Ave., Pontiac, Mich.
Jeschke Wire & Specialty Co., 315 Industrial Ave., Crawfordsville, Ind.
Jones & Laughlin Steel Corp., Pittsburgh.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Ludlow-Saylor Wire Co., St. Louis, Mo.
Raymond Mfg. Co. Div. of Associated Spring Corp., Corry, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
U. S. Steel Wire Spring Co., Cleveland, O.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

Wire Mill Machinery and Equipment
Lewis Machine Co., The, 3455 E. 76th St., Cleveland, Ohio.
McKay Machine Co., The, Youngstown, Ohio.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.
Waterbury (Ct.) Farrel Fdry. & Mach. Co., The.

Wire Rope
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Company
Broderick & Bascom Rope Co., St. Louis, Mo.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Jones & Laughlin Steel Corp., Pittsburgh.
Leschen, A., & Sons Rope Co., St. Louis, Mo.
Macwhyte Co., Kenosha, Wisc.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

Wire Rope Fittings
American Hoist & Derrick Co., St. Paul, Minn.
Macwhyte Co., Kenosha, Wisc.
Roebling's, John A., Sons Co., Trenton, N. J.

Wire Straightening and Cutting Machinery—Automatic
Lewis Machine Co., The, 3455 E., 76th St., Cleveland, Ohio.
Shuster, F. B., Co., The, New Haven, Ct.

Wrenches
Armstrong Bros. Tool Co., Chicago.
Williams, J. H., & Co., Buffalo, N. Y.

Wrenches—Pipe
Greenfield (Mass.) Tap & Die Corp.
Ushco Mfg. Co., Inc., 135 Tonawanda St., Buffalo, N. Y.

Wrenches—Tap
North Bros. Mfg. Co., Philadelphia, Pa.

Zinc—Strip
Platt Bros. & Co., The, Waterbury, Conn.

Zirconium Metal & Alloys
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One to Six Spindles
Tapping Attachments and Multiple Heads

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CHUCKING MACHINES
Four, Five, Six, Eight Spindles · Work and Tool Rotating Types
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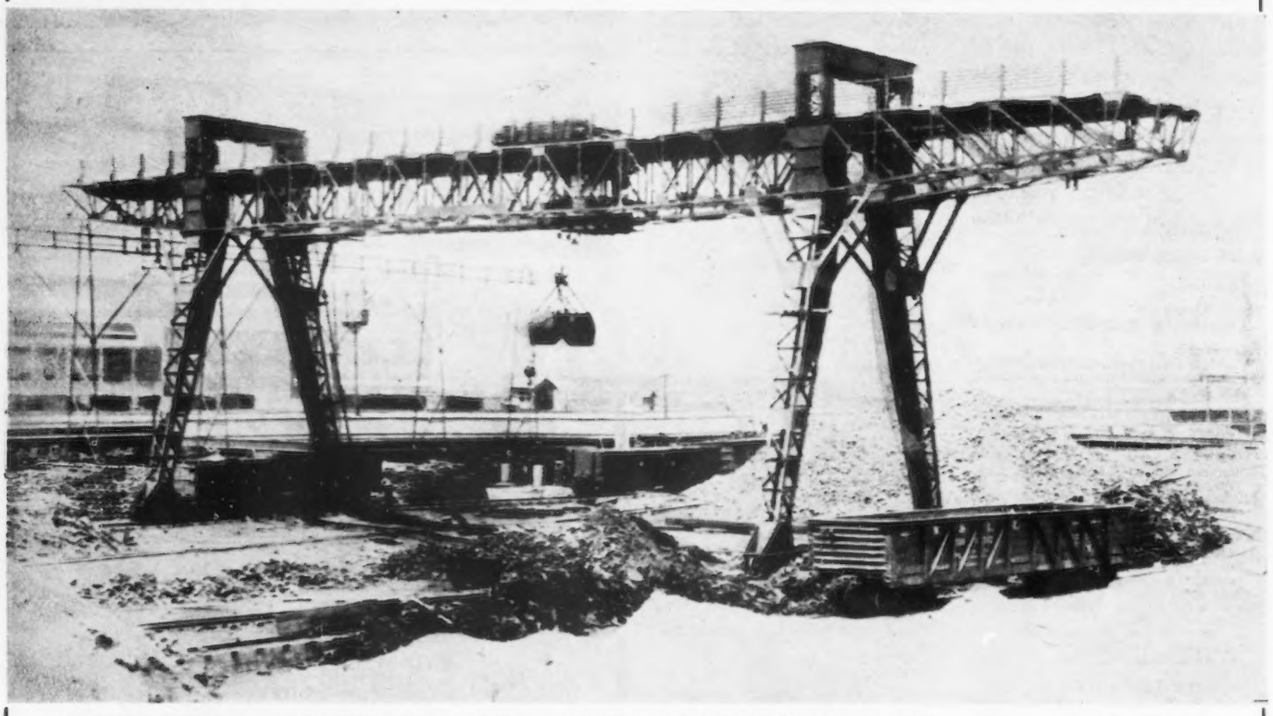
PARTIAL LIST — NUMEROUS OTHER MACHINES ALSO AVAILABLE



5 MOTOR TOLEDO ELECTRIC TRAVELING GANTRY CRANE ARRANGED FOR OPERATION WITH 1½ YARD BUCKET—MAGNET CONTROLS TO HOOK—10 TON HOOK LIFT CAPACITY WHEN WORKING ALONE

SPAN Center to center of rails	100 ft. 0 in.	SPEED—Opening and closing line	150 ft. per minute, 28 H.P. Motor
Cantilever, one end	30 ft. 0 in.	Holding line	150 ft. per minute, 28 H.P. Motor
Cantilever, other end	35 ft. 0 in.	Trolley travel	300 ft. per minute, 28 H.P. Motor
Total length of bridge	165 ft. 0 in.	Magnet Mechanism	75 ft. per minute, 28 H.P. Motor
HEIGHT—Maximum height of crane from top of runway rails	50 ft. 0 in.	Bridge Travel	125 ft. per minute, 28 H.P. Motor

All motors 220 Volt D.C. with Electric Controller & Mfg. Co. "Dinkey" Controllers

PRICE AND FURTHER PARTICULARS ON REQUEST — CAN BE INSPECTED IN OPERATION

20' COVINGTON INITIAL TYPE BENDING ROLL

Bending Rolls 24" Diameter
Rising Roll 18" Diameter
Drop End Housing Motor Driven
Steel Housings
Forged Steel Rolls

CRANES

3 ton P & H	29'6"	Span 220/3/60 A.C.
3 ton P & H	40'	Span 220 Volt D.C.
5 ton P & H	57'	Span 220 Volt D.C.
7½ ton Northern	46'9"	Span 230 Volt D.C.
10 ton Alliance	32'3¼"	Span 220/3/60 A.C.
10 ton Toledo	32'3¼"	Span 220/3/60 A.C.
10 ton Shepard	55'	Span 220 Volt D.C.
15 ton Shaw	46'	Span 230 Volt D.C.
15 ton Niles	48'11⅛"	Span 220/3/60 A.C. Including Phase Changer
15 ton Bedford	52'	Span 220/3/60 A.C.
25 ton Niles	30'	Span 230 Volt D.C.
25 ton Maris	45'	Span Hand Operated
25 ton Shepard	60'	Span 230 Volt D.C. 5-ton Auxiliary
30 ton Alliance	32'3¼"	Span 220/3/60 A.C. 10-ton Auxiliary
50 ton Niles	30'6"	Span 220/3/60 A.C. 5-ton Auxiliary

CRANES—GANTRY

4 ton Link-Belt Steel Gantry Crane 100' span, 4 motors, 220/3/60

FORGING MACHINES

¾" to 7" Ajax, National, Acme, Steel Frame

HAMMERS—BOARD DROP—STEAM DROP—STEAM FORGING

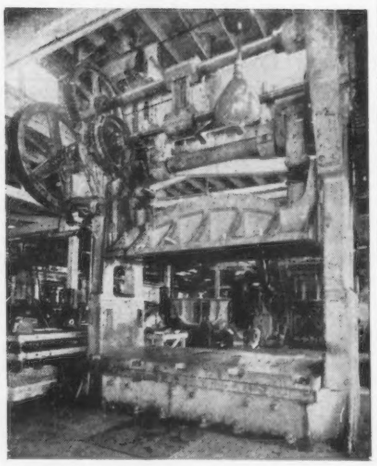
800-8000 lb. Chambersburg, Billings & Spencer, Erie, Niles-Bement-Pond

LEVELLER—ROLLER

50" McKay Roller Leveller, 17" rolls, 4¼" dia. M.D.

MILLING AND SHAVING MACHINE

Newton L-94 Milling and Shaving Machine. 1 vertical spindle, 4 horizontal spdls. Table Drive. Hyd. center feed. Width bet. horizontal cutters 21". Face of vertical spdle. 10"



NO. 96F TOLEDO DOUBLE CRANK PRESS
Tie Rod Construction
124" Between Uprights
12" Stroke
Complete with 40 H.P. Motor

PRESSES—HYDRAULIC

300 ton Hydraulic Shell Piercing Press, Four Column type. 46" Dia. of Ram. 48" Stroke, 41"x65" Between Columns

500 ton United Engineering and Foundry Company. High Speed Hyraulic Forging Press Four Column Type

760 ton Southwark Vertical Press, 20" Stroke, 41½"x19" Between Columns

1200 ton Dunning & Boschert Hyd. Press, 28" ram. Steam heated platen

3000 ton Southwark Forging Press, 3 Column, 17" dia. 7" Between Columns, 15" Stroke 30" Daylight

PRESSES—DOUBLE ACTING—TOGGLE

No. 162 Toledo, 5" stroke of blankholder, 8¼" stroke of plunger, 21"x21" bed area

PRESSES — SINGLE ACTING — STRAIGHT SIDE

No. 166, Consolidated, 6" stroke, 47" between uprights

No. 10-C Bliss Double Crank Press, 6" Stroke, 96" bet. uprights, Bed area 33"x86"

ROLLING MILLS

9"x18" Farrel Rod Rolling Mill, 3 High
10"x16" United E & F Co. Single Stand Two High
12"x15" Mackintosh Single Stand Two High
16"x10" Waterbury Four Stand 2 High
16"x20" Waterbury Farrel Single Stand Two High
16½"x22" Cold Strip Mill 2 Stand 2 High
16" Garrison Bar Mill, 2 Stands 3 High 1 Stand 2 High
21" Mackintosh Bar Mill, 2 Stands 3 High

SAW

50" Mackintosh Hemphill Tilting Frame Hot Saw, Motor Driven, Cap. 8"x8"

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10" 2-spindle, Jones & Lamson, Steel Head.

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2" Pratt & Whitney Spline.
No. 2 Cincinnati Hi Power Miller.

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24" Potter & Johnston.
30" Morton Draw Cut Shaper.

BORING MILLS
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2—72" Bickford Verticals.
1—4" bar, Beaman & Smith Floor Type Horiz.

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No. 11 Pratt & Whitney Multiple Drill.
No. B—16 Natco, Multiple, 34 Spdles.
No. 14 Colburn Drill.
4 Spindle Leland-Gifford Drill.
500# Bradley Hammer.
8" Standard Pipe Machine, M.D.
24 Hilles & Jones Double Punch Shear.
24—48" Brown & Sharpe Gear Cutter.
Nos. 1, 1B, 2 Campbell Nibblers.
No. 21-SA Cochrane Bly Hi Speed Saw.
No. 178 Toledo Toggle Press.

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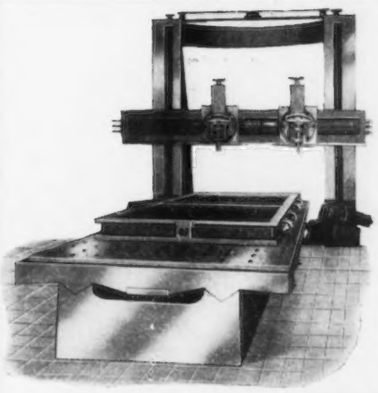

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10' x 10' x 30 FT.
NILES PLANER

2 swivel heads on rail;
2 swivel side heads;
122" between housings;
Table 90" wide x 32 Ft. overall;
Length of bed 50 Ft.
With 50 H.P. A.C. Motor.

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GRINDER—12" P & W Surface Belt Drive, Cap. 12"x36"
LATHE—54"x16' Johnson, motor drive
LATHE—42"x24' New Haven raised to 60" belt
LATHE—20"x12' LeBlond, belt, q.c.
MILLER—No. 2 Kempsmith Plain, table 10"x45" q.c.
MILLER—S. D. Bec'er, Vertical, continuous, mtr. dr., 40" dia. table
MILLER—No. 4A Brown & Sharpe Universal S.P. Drive, table, 16"x48"
SHAPER—24" Cincinnati, belt drive
TURRET—No. 1 Warner & Swasey, 5/8" capacity, bar equipment

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1—#17 BARBER-COLMAN Gear & Spline Hobber
1—#6 WHITNEY Hand Mill
1—3½ PRATT & WHITNEY Duplex Mill
1—#13 NATCO Multiple Spindle Drill, M. D.
1—#2 GARVIN Hand Screw Machine
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No. 421 ALLIS CHALMERS Ro-Twin Compressor 238 Cu. Ft., 100# Pressure
36"x36"x10' Cincinnati Planer, 4 heads, M.D. thru 4 speed gear box

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21″x10′ LeBlond, Q.C.G.
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36″x48′ BRIDGEFORD Geared Head Boring
48″x16′ BEMENT, Triple Gear Chucking

PLANERS

120″x96″x25′ D&H Convertible Openside, Rev. M.D., 230 V. DC.
54″x54″x16′ POND, 4 heads
36″ NEWTON Rotary
60″ N.B.P. Rotary

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24″x8″ B&S Automatic
36″x10″ B&S Automatic
64″x20″ G&E "New Type"
90″ P&W Spur and Worm
Nos. 3 & 4 ADAMS Gear Hobbers

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16″x50″ NORTON Plain Cylindrical
60″ SPRINGFIELD Knife Grinder
55 HEALD, a new machine, M.D.
#60 HEALD Cylinder Grinder

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350 lb.—1100 lb.—1500 lb.—2000 lb. — 2500 lb. Steam Hammers, S.F.

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6x32″ Norton, m.d. (3)
10x18″ Brown & Sharpe Plain Cylindrical, belt
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10x36″ Norton Plain, m.d. (6)
10x50″ Norton Plain, m.d.
10x52″ Landis, m.d.
12x18″ Cincinnati Plunge Cut, m.d.
12x36″ Cincinnati, m.d.
12x36″ Modern, m.d.
12x42″ Landis, bolt
12x48″ Modern, m.d.
12x72″ Cincinnati, m.d., hydraulic feed, late
12x48″ Modern Universal, belt
No. 6 Bryant Chucking, belt
No. 70 Heald Internal, belt
No. 1 Fraser Lapper, belt
No. 3 Brown & Sharpe Planer Type, belt
No. 3 Diamond Surface, belt
No. 255 Heald Rotary, belt
Walker Single Stroke, Surface, belt
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30x84″ Diamond H.D. Face, m.d.
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60″ Bridgeport Face, m.d.
Covell-Hanchett Knife, m.d. 102″ cap.
Cincinnati Valve Seat Grinder, m.d.
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No. 2 Oesterlein Universal Tool & Cutter, belt
No. 3 Brown & Sharpe Universal Cutter & Reamer, belt
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No. 23 Brown & Sharpe Gear Cutter Grinder, belt
Gisholt Universal Tool, belt
Gleason Cutter Grinder, belt
Gould & Eberhardt Gear Cutter Grinder, belt
Landis Chaser Grinder, s.p.d.
Yankee Drill Grinder, belt
U. S. Elec. Tool Polishing Stand, m.d.
Mitchell Type A1 Polishing Stand, m.d.
Springfield Wet Emery Grinder, m.d.
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No. 4 Gardner Disc, belt
No. 6 Gardner Disc, m.d.
No. 20 Gardner Combination Disc & Roll Sander, m.d.
No. 51 Besly Disc, m.d.
No. 120 Gardner Combination Disc, belt

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2½′ Avey Sensitive
3′ American Sensitive
3′ Carlton Sensitive
4′ Hammond Jack Knife
4′ Niles-Bement-Pond Semi-Universal, gear box
4′ Ryerson Plain, gear box, m.d.
5′ American Triple Geared, gear box
5′ Bickford Plain, d.c. drive
5′ Dreses Plain, gear box, m.d.
5′ Niles-Bement-Pond Semi-Universal, m.d.
5′ Prentice Plain, cone
6′ Dreses Plain, m.d.
6′ Niles-Bement-Pond Semi-Universal, m.d.
7′ Dreses Plain, gear box
7′ Fosdick Plain, cone

PLANERS
24″ Cincinnati Crank, 1 head, m.d.
28″x28″x8′ American, 1 head, belt
28″x28″x8′ G. A. Gray, 1 head, belt
30″x30″x8′ G. A. Gray, 1 head, belt
30″x30″x10′ American, head, belt
30″x30″x10′ Cincinnati, 2 heads, belt
32″x32″x8′ Gray, 1 head, belt
34″x24″x8′ Cincinnati, 1 head, belt
36″x36″x10′ Cincinnati, 3 heads, belt
36″x36″x10′ Whitcomb-Blaisdell, 2 heads, belt
36″x36″x13′ Niles-Bement-Pond, 1 rail, 1 side head, belt
42″x42″x16′ Rockford, variable speed m.d., 4 heads
42″x42″x20′ Ohio, m.d., 2 heads
60″x48″x16′ Niles-Bement-Pond, m.d., 3 heads

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6″, 18″ Gleason Straight Bevel Generators
16″ Cincinnati Gear Hobber, m.d.
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No. 3H Brown & Sharpe Gear Cutter
No. 5A Lees-Bradner Gear Generator
No. 6—60″ and 6—72″ Brown & Sharpe Gear Cutters, m.d.
Cross Gear Tooth Rounder
Gleason Spiral Bevel Gear Rougher, s.p.d.
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D. E. Whiton No. 1—26″ Full Universal Spur & Bevel Gear Cutter, old type

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GRINDERS—Cylindrical
18x96″ Brown & Sharpe
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No. 20 Bryant Chucking

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24″x14′ Lodge & Shipley
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3½x60″ Fitchburg Lo-swing
24″x12′ Lodge & Shipley Duplex Crankshaft

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No. 4 Warner & Swasey Universal
No. 5 Foster
No. 7 Foster
No. 4 Millholland
No. 4½ Bardons & Oliver
No. 7 Bardons & Oliver
No. 9 Bardons & Oliver
No. 10 Bardons & Oliver

MILLS—Boring
No. 3 Binsse Horizontal

MILLS—Plain
No. 4 Cincinnati—S.P.D.
No. 3B Brown & Sharpe—S.P.D.
No. 3 Hendey Norton—S.P.D.
No. 2 Rockford—C.D.
No. 33 Kempsmith—S.P.D.
No. 21 Brown & Sharpe—S.P.D.

MILLS—Vertical
No. 2½B Milwaukee—S.P.D.
No. 4B Becker—C.D.

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INGERSOLL 24"x24"x12' SLAB MILLER

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HAMILTON 48"x48"x12' PLANER—4 HEADS—BOX TABLE—M.D.

HAMILTON 42" x 42" x 20' PLANER—4 HEADS

OHIO 38" x 38" x 10' PLANER—2 HEADS

G. & E. 24", 32" SHAPERS; M.D.

BLISS #4 TOGGLE PRESS—TIE ROD

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12"x10" No. 12 Barber Colman hobbers.
8"x10" No. 1 Lees Bradner production hobber.
14"x8" No. 5A Lees Bradner universal hobbers.
26"x8" No. 3 Brown & Sharpe auto spur gear cutter.
28" Gould & Eberhardt automatic spur and bevel.
36"x6" Gould & Eberhardt spur gear cutter.
48"x10" No. 4 Brown & Sharpe automatic spur gear cutter.
15" Gleason bevel gear quencher.
Gleason bevel gear tester.
Gleason circular finishing cutters, without blades.
Bilton automatic gear millers.
National Tool Co. (Cleveland) Model B gear and gear shaper cutter checking machine.
Lipe gear tooth chamfering machine, double spindle.

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1¼" No. 2 Mitts & Merrill.
2" No. 3 Mitts & Merrill.
2½" No. 4 Mitts & Merrill.
Burr keyseat milling machine.

ENGINE LATHES

All have quick change gears unless otherwise noted.
14"x6' Walcott, double back gears, taper attachment.
14"x8' Lodge & Shipley, patent head.
16"x6' Cincinnati, double back gears.
16"x6' Lodge & Shipley.
20"x10' American.
20"x10' Davis, double back geared.
24"x10' Schumacher & Boye, double back gears, taper attachment.
24"x10' LeBlond heavy duty, double back gears, taper attachment.
24"x10' Hendey standard change gear.
24"x12' Lodge & Shipley patent head.
24"x16' Schumacher & Boye, double back gears, taper attachment.
36"x22' Schumacher & Boye, triple geared.

TURRET LATHES

1" (14" swing) No. 2 Milholland.
1¼" (10½" swing) No. 2SP Garvin.
1½" (17" swing) No. 4 Foster, power cross feed.
2¼"x26" Acme.
17½" swing No. 4 Bardons & Oliver.
18" swing No. 4 Cincinnati Acme.
2¼"x24" Jones & Lamson, cross feeding headstock.
3"x36' (14½" swing) Jones & Lamson, cross feeding headstock.
20" swing No. 7 Foster, 3" hole through spindle, power cross feed.
No. 3 Gisholt.
2¼" (20¾" swing) No. 6 Warner & Swasey.
2⅝" (21" swing) No. 9 Foster, power cross feed.
21" Gisholt.
No. 5A Potter & Johnston.
No. 6A Potter & Johnston.
24" Bullard rapid production vertical turret lathe.

PRODUCTION LATHES

7" Sundstrand Mfg.
9" No. 9 LeBlond, geared head multicut.
9" x 14" and 9" x 20" Porter Cable Mfg.
11"x4" LeBlond Mfg.
13"x6' Automatic threading lathes, geared head.
16"x5' Monarch Mfg. or rapid production.
16"x6' Monarch, motor-in-base.
16"x10' LeBlond rapid production.
17"x6' and 17"x8' LeBlond Mfg., geared head.
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18" Gisholt Simplimatics.
20"x8'-6" Wickes geared head mfg.
Melling 4 cylinder camshaft lathe.
Melling 6 cylinder crankshaft lathe.
Wickes center drive crankshaft lathe.

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4" Landis floor type.
5" No. 2 Barrett horizontal, cylinder boring.
24" Bullard vertical mill, with side head.
36" Niles car wheel boring.
42" Bullard, 2 swivel heads, motor drive.
52" Gisholt, 2 swivel heads, motor drive, power rapid traverse.
52" Gisholt, one swivel turret head, one plain swivel head, motor drive, power rapid traverse.
60" Colburn, 2 swivel heads, motor drive, power rapid traverse.
No. 1 Cincinnati, plain, heavy duty.
No. 2½ Rockford, plain.
No. 3 Brown & Sharpe, plain.
No. 2B Rockford, universal.
No. 4 Cincinnati, universal.
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42" Niles-Bement-Pond
54" Colburn
60" Gisholt, motor drive
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76" Bullard

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No. 12 Barber-Colman Hobber
No. ½ Pfauter Hobber, M.D.
No. 2—36" Pfauter Hobber
No. 3—26" Brown & Sharpe
No. 4—48" Brown & Sharpe
No. 6—72" Brown & Sharpe
No. 6-A 72" Cincinnati
96" Newton, M.D.
Nos. 6, 61, 62 Fellows
No. 36-BM Gould & Eberhardt

Grinders
No. 70 Heald Internal
No. 60 Heald Cylinder
No. 2½ Universal (Bath Type)
10"x36" Thompson Universal
No. 4—12"x66" Landis Universal
16"x32" Landis Crankshaft
No. 5 Springfield Planer Type Surface
No. 2—18" Gardner Disc

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3½"x36" Fitchburg Lo-Swing
3½"x60" Fitchburg Lo-Swing
3½"x108" Fitchburg Lo-Swing
8"x60" Fitchburg Lo-Swing
18"x6' Bradford Geared Head
18"x8' Lodge & Shipley
20"—40"x10' Rahn-Larmon Geared Head Sliding Bed Gap
24"x12' American
24"x13' Chard
24"x16' Lodge & Shipley
24"x18' Lodge & Shipley
24"x20' L. & S. Grd. Hd. Taper
24"x22" Lodge & Shipley, taper attachment
25"x10' Le Blond Heavy Duty
27"x18' American Geared Head, taper Att.
30"x12' Whitcomb-Blaisdell
30"x12' Lodge & Shipley
36"x16' American, Taper
36"x24' Bradford Triple Geared, Taper Att.
40"x12' Fifield

Millers
Type "B" Briggs Mfg.
No. 12 Pratt & Whitney Mfg.
No. 5 Brown & Sharpe Vertical
No. 5-B, No. 6 Becker Vertical
Model C2 Becker Vertical
Type ACS Becker Vertical
24"x24"x12' Ingersoll Adj. Rail
36"x36"x12' Newton Duplex
38"x44"x20' Ingersoll Slab
72"x16"x14' Ingersoll
No. 1 Smalley-General Thread

Planers
24"x24"x 6' Cincinnati
24"x24"x 6' Powell
24"x24"x 6' Rockford
24"x24"x12' Gray
30"x30"x 8' American
36"x36"x 8' Cincinnati
36"x36"x12' American
36"x36"x18' Cincinnati
40"x30"x 7' Gray
42"x42"x14' Gray
48"x48"x10' Niles-Bement-Pond
60"x48"x20' Hamilton
72"x60"x16' American

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No. 1 V. & O., M.D.
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No. 58 Toledo Nosing
No. 178 Toledo Toggle Drawing

Turret Lathes
18" Dreses Fox Monitor
2¼"x26" Greenlee
3¼"x40" Greenlee
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24" Gisholt, 6¼" H.S.
26" Libby, 7½" H.S., Taper Att.

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3½', 4, 5, 6' American Triple Geared.
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16, 20 and 24" Gould & Eberhardt cone drive.
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All machines motor driven — 3/60/220 volts.

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36"x36"x10' INGERSOLL Milling Machine
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10" NEW HAVEN Slotter
20"x7' CHARD Heavy Duty Lathe tap. attch.
22"x16' BLAISDELL Lathe 10' centers
14"x8' SEBASTIAN Gap Lathe

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2—HEALD Borematics

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PRESSES FOR FORGING, DRAWING, STRAIGHTENING, FORCING, FORMING, ETC.

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9—250 Ton Rev. Cyl., 16" Ram, 2500#
1—600 Ton Rev. Cyl., 24" Ram, 2500#
2—1100 Ton Rev. Cyl., 34" Ram, 2500#
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HP	MAKE	TYPE	VOLTS	SPEED
1—3000	Whse.	Interpole	600	50/70
1—1500	Whse.	Interpole	600	330
1—1250	Whse.	P. F. Wdg.	550	600/750
1—1200	G.E.	MPC	550	450
1— 900	Cr. Wh.	CMC	250	400/500
1— 800	Whse.	Interpole	550	200/300
1— 750	G.E.	MPC	250	250/450
1— 600	Whse.	Interpole	250	150/275
1— 600	G.E.	MPC	550	600/750
1— 370	G.E.	MPC	250	120

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Partial Listings

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1000	G.E.	250/125	Synch.
300	G.E.	250/125	Synch.
200	Westh.	600	Slip
150	West.	600	Synch.
100	Burke	600	Sq. Cage
100	G.E.	125	Sq. Cage
75	C-W	125	Sq. Cage
75	G.E.	240	Sq. Cage
75	G.E.	250/125	Synch.
60	G.E.	60	Sq. Cage
60	West.	125	Synch.
60	G.E.	250/125	Sq. Cage
50	G.E.	125	Sq. Cage
50	Burke	250	Sq. Cage
50	C-W	125	Sq. Cage
50	Sprague	115	Belt
45	G.E.	125	Belt
45	West.	125	Belt
40	G.E.	115	Sq. Cage
40	G.E.	1000	Sq. Cage
40	West.	125	Sq. Cage
36	G.E.	45	Sq. Cage
35	Imp.	250	Sq. Cage
30	West.	60	Sq. Cage
30	Star	250/125	Sq. Cage
30	G.E.	600	Sq. Cage
30	El. Pr.	125	Sq. Cage
26	G.E.	33	Sq. Cage
25	El. Machy.	125	Synch.
25	West.	500	Sq. Cage
25	West.	125	Sq. Cage
24	G.E.	60	Sq. Cage
15	Star	125	Sq. Cage
15	G.E.	250/125	Sq. Cage
15	G.E.	230	Sq. Cage
15	West.	230	Sq. Cage
13¾	Star	125	Belt
10	G.E.	1500	Sq. Cage
10	G.E.	125	Sq. Cage
9	G.E.	250	Sq. Cage
7½	West.	110	Sq. Cage
5¼	Eck.	1500	Sq. Cage

230 VOLT VARIABLE SPEED D.C. MOTORS

H.P.	MAKE	TYPE	RPM
150	West.	SK	325/975
100	G.E.	CO	675/1700
100	C-W	CMC	550/990
75	El. Dy.		700/1050
75	Sprague		1000/1500
60	Rel.		550/675
50	G.E.	CO	725/1800
25	Sprague	LC	350/1050
25	G.E.	CD123	300/1200
25	G.E.	RF	500/1500
20	G.E.	RLC	600/1800
15	C-W		900/1800
15	West.	S	875/1600
15	Burke	WA6	400/1200
15	El. Dy.	10S	450/900
15	G.E.	RF11	400/1200
13	G.E.	RF11	400/1600
10	Sprague		1000/1500
10	West.	SA	500/1500
10	West.		450/1800
10	G.E.	RF10	400/1600
10	G.E.	RLC	400/1200
9	G.E.	RF10A	450/1800
8	G.E.	RLC	500/1500
7½	G.E.	CD83	600/1800
7½	G.E.	RLC	300/1200
7½	A-C		350/1050
7½	West.	SK90	400/1600
7½	West.	SA	400/1600
7½	G.E.	RLC	400/1600
7½	G.E.	CQC	400/1600
7½	West.	SK	450/1600
7½	G.E.	RF	450/1800
7½	Burke		500/1500
7½	Watson		525/1150
7½	El. Dy.		550/1050
6	G.E.	RF	450/1800
5	West.		500/1500
5	G.E.	RC	600/1200
5	Rel.		500/1500
5	G.E.	RLC	450/1500
5	G.E.	CD83	450/1800
5	G.E.	RF9	450/1800
5	G.E.	RF	450/1350
5	G.E.	RF	300/1200
3	G.E.	RLC	500/1500
3	West.	SK	500/2000

230 VOLT D.C. MOTORS

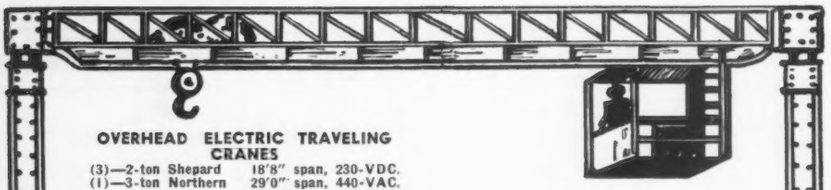
H.P.	MAKE	TYPE	RPM
150	G.E.	RC36	1750
75	West.	SK160	850
75	El. Dy.		1050
60	West.		1700
60	G.E.	RC15	1000
60	Sprague	LC	900
60	Roth		600
60	Rel.		550
50	G.E.	CD105	1150
50	G.E.	RC15	850
40	Sprague	LC	1700
40	Rel.		625
30	G.E.	RC31B	1200
30	G.E.	CD105	850
25	G.E.	RC31	1150
25	West.	SK120	825
25	C-W		700
20	West.	SK83	1750
20	G.E.	CD83	1750
20	G.E.	RC31	1750
20	G.E.	RC30	1150
20	G.E.	CD85	1150
20	G.E.	RC31B	800
15	G.E.	CD75	1750
15	West.	SK	1100

ELECTRIC WELDERS

500 amp.	West. Multiple	250 amp.	G.E.
400 amp.	West.	200 amp.	Star (2)
300 amp.	Lincoln (4)	200 amp.	Burke
300 amp.	Wilson	200 amp.	Lincoln (3)
300 amp.	U.S.L. (2)	150 amp.	Lincoln (2)

L. J. LAND and COMPANY

150 Grand Street, New York, N. Y.



OVERHEAD ELECTRIC TRAVELING CRANES

(3)—2-ton Shepard 18'8" span, 230-VDC.
(1)—3-ton Northern 29'0" span, 440-VAC.
(1)—3-ton P & H 27'9" span, 220-VAC.
(1)—5-ton Shepard 16'0" span, 230-VDC.
(1)—5-ton Euclid 34'3" span, A.C. or D.C.
(2)—5-ton Niles 35'0" span, 115-VDC.
(2)—5-ton Shaw 52'0" span, 220-VAC.
(5)—3 & 5-ton Whiting 48' & 50' span, 220-VAC.
(1)—15/5-ton P & H 35'2" span, 230-VDC.
(2)—15-ton Toledo 40'4" & 47'3" span, 220-VAC.
(1)—15-ton P & H 46'0" span, A.C. or D.C.
(1)—25/5-ton P & H 34'6" span, A.C. or D.C.
(1)—25/5-ton Morgan 53'0" span, 110-VDC.
(1)—50-ton Northern 29'0" span, 110-VDC.
SPECIAL 2—15/5-ton Shaw 112'0" span, 230-VDC.

GANTRY CRANES

(1)—10-ton Toledo, 100'0" span, 30' & 35' overhang, 35' lift, 230-VDC. Bucket & Magnet drums.

ELECTRIC MONORAIL HOISTS

(25)—¼—½—1—2 & 3-ton Shepard, 110 & 230-VDC.
(4)—1-ton Yale & Towne & LoHed, 220-VAC.
(8)—2 & 3-ton Shepard 2-motor, fl. & cage control, 230-VDC.
(8)—2 to 5-ton Shepard D.C. motorized trolleys.
(4)—Shepard 230-VDC. stationary hoists, 2-ton capacity
(1)—3-ton Link Belt, 440-VAC., 40-ft. lift.

AIR HOISTS

(4)—1-ton Ingersoll-Rand
(1)—3-ton Chicago Pneumatic

BUCKETS

(1)—1¾-yd. Hayward, 440/3/60-cy.
(1)—1½-yd. Hayward, 230-VDC.
(1)—2-yd. Blaw Knox 2-line

MAGNET

(1)—45" E.C.&M., 230-VDC.

STEAM DROP HAMMERS

(1)—2500 lb. Niles-Bement-Pond.
(2)—1200 lb. Massillon.
(1)—1000 lb. Chambersburg.
(1)—1½" Acme Unsetter.

HEROULT ELECTRIC FURNACE

(1)—3-ton cap. 1500-KVA., Transformer 2300-volts, 3-PH. 60-CY. Complete with panel, electrode motors, etc.
(REBUILT TO YOUR REQUIREMENTS)

CRANE & MILL MOTORS

(150)—G.E. C.O. & Westgshe. type K, 1 to 85-HP. 230-VDC.
(35)—G.E. & Westgshe. 2 to 50-HP., 220/440-volts, A.C.
(50)—220-VAC. & D.C. Reversing Controllers.
(1)—G.E. MD-104½, 30/45-HP., 230-VDC.
(1)—G.E. MD-106, 60/80-HP., 230-VDC.
(1)—Westgshe. MCB-100, 150-HP., 230-VDC, compound.

STORAGE BATTERIES & GASOLENE TRUCKS

(1)—Clark Gasolene trucktractor.
(2)—30-cu. ft. Clark Gasolene Dump Trucks.
(1)—2-ton Yale & Towne Battery Lift Truck.
(1)—3-ton Automatic Battery Lift Truck.

FOUNDRY EQUIPMENT

(2)—Batteries 3-each, Young Bros. Gas Fired Core Ovens, each oven 12'6" deep, 8' wide x 7'6" high, double door, 4" insulation, still erected with all accessories.

ALL ABOVE IN STOCK. *IMMEDIATE SHIPMENT.*

T. B. MAC CABE CO.

Belfield Ave. & Armstrong Lane, Germantown, Philadelphia, Pa.

Mere for Deres dollar!

"Anything containing IRON or STEEL"

SEND ISP YOUR INQUIRIES AND OFFERINGS WHEN OTHERS FAIL YOU!

OUR "Line"

CARS; any kind
CARS; Dump, Ballast, Work, etc.
CAR REPAIR PARTS (Save 50%!)
LOCOMOTIVES; any kind
PASSENGER-TRAIN CARS; any kind
RAILS; relaying. Any delivery
IRON & STEEL; Merchant
SURPLUS, OBSOLETE and REJECTED STOCKS; new or used
BUILDINGS & STRUCTURES; steel
CRANES; ground, overhead and gantry, Also Runways
POWER PLANT EQUIPMENT; boilers, generators, turbines, motors, etc.
EARTH HANDLING EQUIPMENT; mining, quarry, contractors', etc.
ABANDONED PLANTS, MACHINERY & EQUIPMENT
SCRAP-IRON; plain, nickel, tungsten, etc.

IRON & STEEL PRODUCTS, Inc.

36 years' experience

13496 So. Brainard Ave., Chicago, Illinois

SELLERS BUYERS TRADERS

D C CRANE MOTORS
also Controllers
D C ADJUSTABLE SPEED MOTORS
controllers to match.
Lifting magnets, magnetic separators

Goodman Electric Machinery Co.
1060 Broad Street Newark, N. J.

LOCOMOTIVES

2—VULCAN 55 ton steam, standard gauge built 1933, air brakes, power reverse, thoroughly modern, used only 11 months, for sale or rent.
1—50 ton 4 wheel saddle tank locomotive.
1—60 ton and 1—65 ton 6 wheel saddle tank standard gauge locomotives.
All in condition for immediate service and delivery.

MOTOR GENERATOR SET AND MD MOTORS

1—65 KW 230 volt DC 1200 RPM 3 phase, 60 cycle, 2200 volt, 100 H.P. 2—30 H.P. and 1—100 H.P. MD 104 and MD 106 motors, 220 volt with reversing controllers and resistance.

LOCOMOTIVE CRANES

1—25 ton and 1—30 ton standard gauge steam locomotive cranes.

DIESEL OIL ENGINE

1—Diesel Oil Engine 450 H.P. Cooper Bessemer 4 cycle, 4 cylinder, 225 RPM with or without 300 KW 2200 volt AC generator.

HOIST

1—Hoist, single drum electric mine type 7'6" dia. 5' face, 300 H.P. AC motor.

A. J. O'NEILL

Lansdowne Theatre Building
LANSDOWNE, PA.
Philadelphia Phone: Madison 8300

OVERHEAD CRANES

No.	Make	Tons	Span	Motors	Control
1	Shaw	100	75'	6-220V.D.C.	Cab
1	Shaw	50	75'	4-220V.D.C.	Cab
1	Niles	25	30'	3-110V.D.C.-A.C.M.G. Set	
1	Shaw	15	55'	3-1A.C. 2D.C.	Cab
1	Shaw Box	15	33'	3-220V.D.C.	Cab
1	Shepard	10	49'	3-220V.D.C.	Cab
1	P&H	10	45'	3-220V.D.C.	Cab.
1	Erie	5	58'2"	3-220V.D.C.	Floor
2	P&H	5	45'	3-220V.D.C.	Cab
1	Whiting	5	22'6"	2-550V.3P. 60C.	Floor
1	Northern	3	37'8"	3-220V.D.C.	Cab
3	Shaw	2	32'to43'	3A.C.	
2	Northern	2	37'8"	3-220V.D.C.	Cab
1	Shepard	2	22'6"	3-550V.3P. 60C.A.C.	Floor
1	Roeper	1	35'	3-220V.3P. 60C.A.C.	Cab

1 TO 10 TON HOISTS

N. B. PAYNE

105 W. 55th St., New York Tel. Cl. 7-6730

CRANES

15-ton Morgan D.C. 60'7" span
5-ton Niles D.C. 48' span
2-ton Niles D.C. 36' span
2-ton Northern D.C. 36' span

HOISTS

4-ton Shaw D.C. Monorail Hoist
4-ton Shaw A.C. Monorail Hoist
2—1-ton Shepard D.C. Monorail Hoists
2-ton Shepard D.C. Electric Hoists

TRUCKS

6—Type TA Elwell Parker 3-wheel Truck Tractors —complete with Edison Type A8 30 cell storage batteries
Lakewood 2-ton Tierlift Electric Truck with dump bucket attachment

DONAHUE STEEL PRODUCTS CO.

74th St. & Ashland Ave., Chicago, Ill.

FOR SALE

SAND BLASTING AND METAL SPRAYING OUTFITS

FRED. S. GICHNER IRON WORKS, INC.
1214 24th St., N. W., Washington, D. C.

FOR SALE

25 Ton OHIO Locomotive Crane
30 Ton Model 3-G BROWNING Loco Crane
50 Ton INDUSTRIAL Loco Crane
3 LAMBERT Portable Gantry Cranes
2 AMERICAN Revolvers "685" New

"STONE *the Crane man*"
502 Insurance Exchange Bldg., Detroit, Mich.

INDUSTRIAL CRAWLER CRANE

A versatile machine with short boom; will handle a wide variety of work, including pushing, pulling, and lifting work as well as numerous drum hoist applications. Travels fast, works fast, lifts up to 35,000 pounds In excellent condition. Equipped with 55 H.P. Waukesha Engine. Will sacrifice for quick sale.

***Write or Wire* Robert E. Young, 4400 W. National Avenue, Milwaukee, Wisconsin.**

OVERHEAD ELECTRIC TRAVELING CRANES

Priced Right for Quick Sale

5-ton SHAW, 27'6" span, cage control, 3-motors 220V DC, structural truck ends, fish belly type girders.
10-ton P&H 48'5" span cab control, 3-motors 220V DC, 62" top clearance.
25-ton P&H 55 ft. span, 4-motors 3/60/220V AC with 10-ton Aux.
25-ton WELLMAN Engr. 53 ft. span, 30' lift, 3-motors 110V DC, bridge fish belly type girders.
50-ton NORTHERN 28'10" span, 3-motors GE 110V DC, cage control.

SCULLY-JONES & COMPANY
(Fdry. Div.)
1907 S. Rockwell St., Chicago, Ill.

OVERHEAD CRANES & HOISTS

1—5-ton SHAW, 3-motor, 31'-6" span, cage controlled, 220 vo. D.C.
3—15, 20 and 30-ton ALLIANCE cranes, 49'6" span, 3 and 4-motor, cage controlled, 220 vo. D.C.
1—10-ton CLEVELAND, 3-motor, 38'8" span, cage controlled, 220 vo. D.C.
1—5-ton ALLIANCE, 3-motor, 43'0" span, cage controlled, 220 vo. D.C.
1—3-ton SHEPARD, 3-motor, 32'6" span, floor controlled, 220 or 440 vo. 3 ph. 60 cy.

Send Me Your Crane and Hoist Inquiries.

JAMES P. ARMEL

925 Fulton Bldg.—Pittsburgh, Pa.

The Clearing House

FOR SALE

STEEL STRUCTURAL BUILDING

With Cranes

64' wide, 255' long, 44' high

20-TON CRANE

60' span, cab control,

with 5-ton auxiliary

5-TON CRANE

60' span, cab control,

3/60/220 volt A.C. motors

Can be removed or will sell with ground, two switch-tracks, one inside and one outside building.

Another building on premises with two 10-ton cranes, 30' span and outside crane runway.

LOCATED NEAR CHICAGO

ATLAS EQUIPMENT COMPANY

101-107 S. Clinton St.

Chicago, Illinois

Phones: Randolph 7017-18

Four 30 ton #3 American Terry Guy Derricks 110' mast 100' boom complete with roller bearing blocks

One 20 ton #2 American Terry Guy Derrick 100' mast 90' boom complete with blocks

One Tracy 200/400 H.P. fluid type Dynamometer

One Tracy 50/105 H.P. fluid type Dynamometer

UNITED HOISTING CO., INC.

880 East 136th Street, New York, N. Y.

CRANES AVAILABLE NOW

5 ton Box, D.C., 50'0" span

3 ton Shepard, D.C., 45' span, transfer type

2 ton Shepard, hand cranes, 33' span

Electric Hoist & Motor Co.

62 Bayard St., Brooklyn, N. Y.

CATERPILLAR & LOCOMOTIVE CRANES

20 Ton Ohio Steam Loco. Crane.
3—25 Ton Browning Steam Loco. Cranes.
30 Ton Industrial Brownhoist Loco. Crane.
35 Ton Industrial Loco. Crane.
15 Ton Link-Belt 50' Boom, Gas. Cat.
25 Ton Lima 60' Boom, Diesel Cat.

R. C. STANHOPE, INC.

60 East 42nd Street, New York, N. Y.

BLAST FURNACE and STEEL PLANT EQUIPMENT

1—McKee Revolving Top with Aux. Hopper. Built 1925, used less than 2 years.
2—5-TON Hulett Ore Buckets.
3—1½-Yd. Brown Ore Buckets.

IRON & STEEL PRODUCTS, INC.

13496 S. Brainard Ave., Chicago, Illinois

"ANYTHING *containing IRON or STEEL*"

100-Ton **ELECTRIC SWITCHING LOCOMOTIVE,** S.G. Baldwin-Westhse; 1500 v. D.C. full load, 750 v. half speed. New 1930. Overhauled. Ready for service. EXCELLENT CONDITION.

— ALSO —

25-Ton 0-4-0 Davenport Loco., S.G. EX. COND. NEW FLUES.

2, 42-Ton 0-4-2 AMER. S.G. S/T LOCOS. EX. COND.

6, 55 to 75-Ton 0-6-0 Switchers.

OTHER LOCOMOTIVES, TOO

IRON & STEEL PRODUCTS, Inc.

36 years' experience

13496 S. Brainard Avenue

Chicago (Hegewisch Station), Illinois

"*ANYTHING containing IRON or STEEL*"

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WANTED

1 PERCUSSION POWER PRESS

Zeh-Hahnemann system or similar, 150 ton to 400 ton capacity, 16"-20" stroke.

Alloys Recovery Company, Inc.

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WANT TO BUY

POWER PRESS BRAKE

10 gauge, or heavier, 3/16 or ¼"—6, 8 or 10 ft. Dreis & Krump, Clearing, Verson, Cincinnati or similar type. Wire your offering.

Kerrigan Ornamental Iron Works, Inc.

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WANTED

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1—2500 Cubic Foot Air Compressor, 100 pound pressure, 3 phase, 60 cycle, 2300 Volt Motor.

F. H. CRAWFORD CO., INC.

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WANTED

Oil Storage Tanks, Horiz. & Vert., all sizes. Flat Cars, Gondolas, Hoppers, Tank Cars, Switching Locomotives, 50 to 80 ton capacity.

Cranes, 5 to 150 ton, 50 to 95 ft. span.

KEYSTONE MACHINERY COMPANY

320—Fourth Avenue, Pittsburgh, Pa.

MIDLAND STEEL & EQUIPMENT COMPANY

400 South Clinton Street, Chicago, Illinois

The Largest Buyers of Surplus Steel Inventories

MERCHANT IRON or STEEL

Plates, Sheets, Bars, Structurals, Etc.
(Prime, seconds, misrolled, used, etc.)

Prices no Obstacle

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13496 S. Brainard Avenue, Chicago, Illinois.

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SPECIAL 100—All Steel 50 Ton Hoppers

35—40 ton steel u/f flats.
20—50 ton steel u/f flats.
15—30 ft. all-steel Gons. A1 condition.
200—30 ton steel u/f box cars.
25—50 ton all-steel Gons.
25—30 ton steel Gons., St. Ga. Blt. 1928.

LOCOMOTIVE CRANES

Saddle Tank Locomotives

RAILS

Complete Stocks at 90# 85# 75# 70# 65# 60# and lighter weights, with angle bars, carried at principal points throughout the country, available for rail or water shipment.

HYMAN-MICHAELS COMPANY

122 So. Michigan Ave. Chicago

RAILS "1 Ton or 1000"

NEW RAILS—5000 tons—All Sections—All Sizes.
RELAYING RAILS—25,000 tons—All Sections—All Sizes, practically as good as New.
ACCESSORIES—Every Track Accessory carried in stock—Angle and Splice Bars, Bolts, Nuts, Frogs, Switches, Tie Plates.

Buy from One Source—Save Time and Money. 'Phone, Write or Wire.

L. B. FOSTER COMPANY, Inc.

PITTSBURGH NEW YORK CHICAGO

RELAYING RAILS

16 lb. to 130 lb. New and Relaying Rails complete with angle bars. Spikes, bolts, tie plates, etc. Frog and switch material. All type cars and locomotives.

M. K. FRANK

480 Lexington Ave. New York City

450 Fourth Ave. Pittsburgh, Pa.

RELAYING RAILS

80 lb. A.S.C.E. section with necessary splices

Prompt Shipment

HENRY LEVIS & CO.

Commercial Trust Bldg., Philadelphia, Pa.

FOR SALE OR RENT

1—P & H Model 900 diesel operated shovel, full revolving crawler tread, 33' boom 22' dipper sticks with 3 yard or 3½ yard dipper. First class condition; immediate delivery.

A. J. O'NEILL

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LANSDOWNE, PA.
Philadelphia Phone: Madison 8300

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COPPER AND NICKEL ELECTRO PLATING PLANT. PRACTICALLY NEW. COMPLETELY EQUIPPED.

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Care *The Iron Age*, 100 E. 42nd St., New York

PULVERIZED COAL PLANT

of 5 ton hourly capacity, consisting of a Ruggles-Coles Dryer, Raymond Bros. Pulverizer, three Coal Storage Bins, Fans, Separators and Dust Collectors, and arranged for pneumatic transportation of pulverized fuel.

Specifications upon request

A. M. BYERS COMPANY

Clark Building, Pittsburgh, Pa.

FOR SALE

GRAY IRON FOUNDRY

equipped for light production work. ¾ acre. 10,000 sq. ft. moulding space. Can be filled profitably on local business within 30 days.

Established 1863

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Building Suitable For Sub-Contract Manufacturing or Sub-Assembly

Modern, one-story, steel and brick building containing approximately 28,000 sq. ft. of floor space. Building is well lighted and equipped with two 3-ton and two 5-ton floor-operated cranes. Separate service building equipped with washroom and toilet facilities, and an office building with an area of 2,400 sq. ft. Parking space nearby. Shipping facilities include spur track into main building arranged for car-floor-level loading. All contained on about 1¾ acres, approximately 75,000 square feet of land. Houston, Texas.

3-STORY BUILDING containing 42,000 sq. ft. of floor space suitable for light manufacturing, warehousing or sales purposes. Located in the center of city. Railway siding nearby. Tulsa, Okla.

MILL BUILDING, containing 22,500 sq. ft. of floor space, on a tract of about 8 acres of land. Railway facilities adjoining. Ample housing facilities nearby. Pennsylvania.

For detailed information or an appointment to inspect these properties, write

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H. H. Harrison, Director.
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EXECUTIVES $2,400-$25,000

This reliable service, established 1927, conducts confidential negotiations for high grade men who either seek a change, or the opportunity of considering one, under conditions assuring, if employed, full protection to present position. Send name and address only for details.

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WANTED—FOUNDRY EXPERT with good metallurgical background in gray cast iron. Must be prepared to do occasional traveling. Give full particulars of experience and state salary required. Address Box W-537, care *The Iron Age*, 100 E. 42nd St., New York.

HELP WANTED

WANTED IMMEDIATELY

Superintendent **for small rolling mill now being erected on the West Coast. Also experienced electric steel furnace operators and metallurgist. Please give age, record and salary now receiving.**

ADDRESS BOX W-542
Care *The Iron Age*, 100 E. 42nd St., New York

WANTED NOW: ENGINEERING EXECUTIVES—Purchasing Directors, Manufacturing Controllers, Cost, Industrial, Lubrication, Sales Engineers. Permanent. Confidential. Write DERRY PLAN, 872 Hanna Building, Cleveland, Ohio.

PRODUCT DEVELOPMENT ENGINEER. To develop new products and uses for steel pipe. Should have good commercial sense, in addition to technical ability. Experience in consumer's goods industry desirable. Give full details of training and experience in reply. Address reply to Box W-529, care *The Iron Age*, 100 E. 42nd St., New York.

WANTED IMMEDIATELY: Works Managers, Shop Superintendents, General Foremen, Chief Engineers, Industrial Engineers, Designers and Draftsmen of all kinds at top salaries—All locations. Write for application. Confidential. Established 26 years. HARRISON PERSONNEL SERVICE, 20 W. Jackson, Chicago.

METALLURGIST—EXPERIENCED MAN, technical college graduate. Previous experience in strip mill required and should include processing of strip steel, particularly high carbon. Qualifications should be such that applicant will be capable of taking charge of metallurgical department, including plant testing work. Address Box W-558, care *The Iron Age*, 100 E. 42nd St., New York.

SPRING ENGINEER—Supervise operations of spring department manufacturing small coil and flat springs. Knowledge of Fundamentals of Spring Design and Practical experience essential. Permanent position in established company located in New England. Give details. Address Box W-562, care *The Iron Age*, 100 E. 42nd St., New York.

SALESMAN BY SEAMLESS TUBE MILL. Technical college training preferred with steel product sales experience. Supply full particulars by letter. Address Box W-534, care *The Iron Age*, 100 E. 42nd St., New York.

SITUATIONS WANTED

SUPERINTENDENT OR ASSISTANT: 39 years of age, twenty years experience in steel. Natural born mechanic, inventive ability. Graduate industrial and personnel management. Studied mechanical engineering, accounting; roller; foreman; assistant superintendent of a small plant. Address Box W-541, care *The Iron Age*, 100 E. 42nd St., New York.

METALLURGICAL ENGINEER with warehouse sales promotion experience looking for responsible connection with aggressive steel warehouse. Willing to consider small investment. Address Box W-544, care *The Iron Age*, 100 E. 42nd St., New York.

METALLURGICAL ENGINEER—extensive technical training and industrial experience foundry, forge, heat treating, welding. Plant control, research, development. Address Box W-530, care *The Iron Age*, 100 E. 42nd St., New York.

PRODUCTION ENGINEER with fifteen years tooling, production, design and cost reduction experience in the metal industries seeks permanent connection. Address Box W-546, care *The Iron Age*, 100 E. 42nd St., New York.

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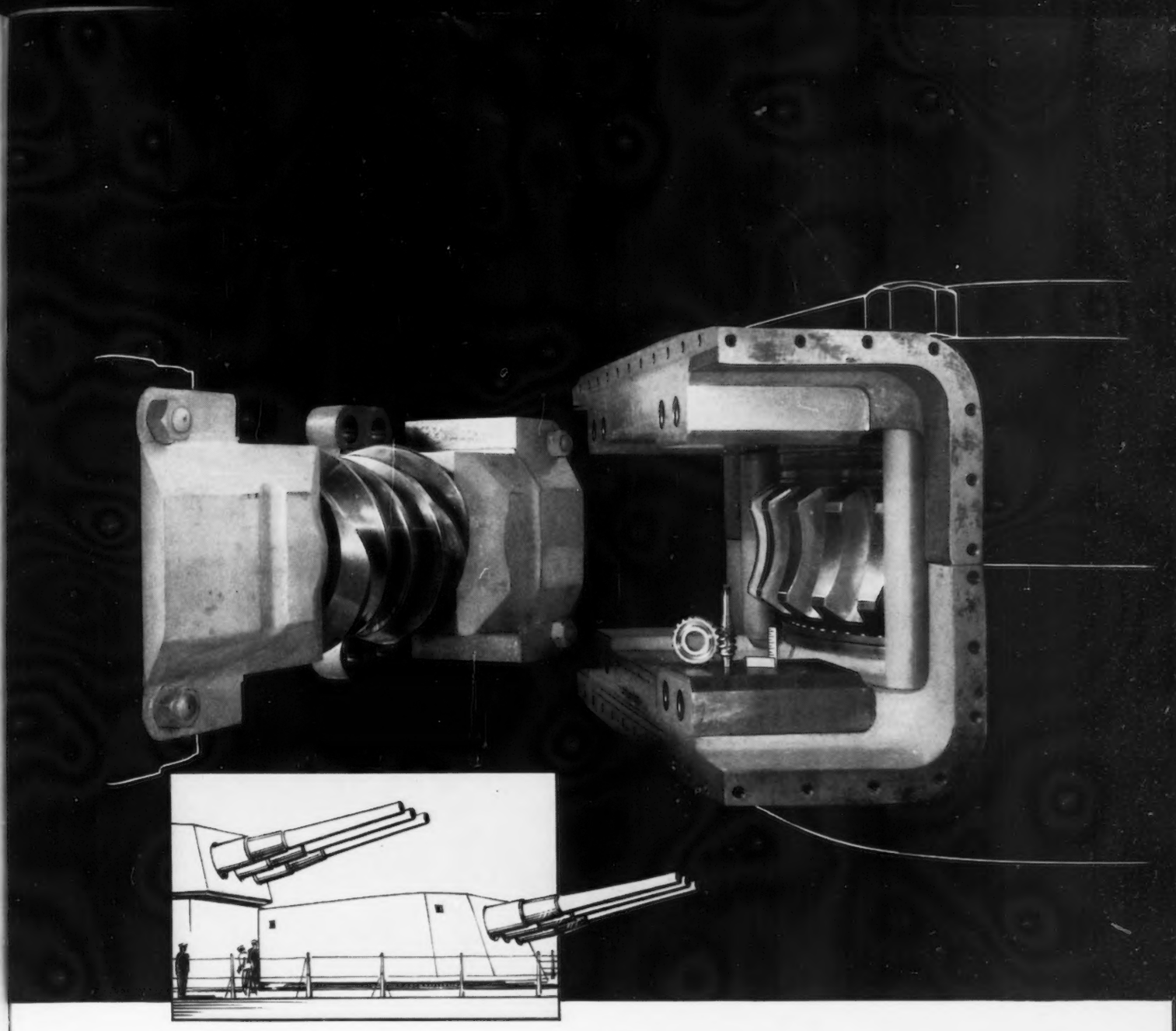

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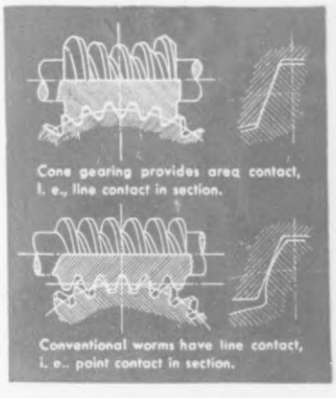
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